



## **Investment Advisory Committee (IAC) Meeting**

**VRS Boardroom  
Bank of America  
Pavilion Building, 3rd Floor  
Wednesday, 4/10/2024  
9:00 AM - 12:30 PM ET**

### **1. Approval of Minutes (August 23, 2023, November 15, 2023)**

*08-23-23 - IAC Meeting Minutes - Page 2*

*11-15-23 IAC Meeting Minutes - Page 6*

### **2. CIO Report**

*CIO Report - IAC April 2024 040424 - Page 9*

*Asset Allocation Report January 2024 - Page 22*

*Daily Asset Allocation Report 04-03-2024 - Page 23*

*Performance Summary 01-31-2024 - Page 24*

*Total Fund Tracking Error - Page 25*

*New Investments and Terminations 04-10-2024 - Page 26*

### **3. Portfolio Diversification Update**

*Portfolio Diversification - Leverage Update 2024 04 - Page 28*

### **4. Public Markets Program Review**

*04-10-24 Public Markets Overview Presentation, 040224 - Page 41*

*04-10-24 Public Equity Presentation, 040524 - Page 46*

*04-10-24 Fixed Income Presentation, 040524 - Page 91*

### **5. Benchmarks and Performance Hurdles Review**

*Benchmark-Hurdle Study - RVK, 040524 - Page 111*

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## Minutes

A meeting of the Investment Advisory Committee of the Virginia Retirement System was held on August 23, 2023 with the following members present:

Larry Kochard, Chairperson  
Hance West  
Michael Beasley  
Theodore Economou, joined remotely under § 2.2-3708.3  
Palmer Garson  
Tom Gayner  
Nancy Leake  
Bryan Lewis

The following Board members were present:

A. Scott Andrews  
Joseph Montgomery  
Brandon Bell  
John Bennett  
Michael Disharoon

The following staff members were in attendance:

Trish Bishop, Andrew Junkin, Jennifer Schreck, Stephen Adelaar, John Alouf, Advait Apte, Rory Badura, Daniel Ball, Parham Behrooz, Erica Billingslea, Jeanne Chenault, Michael Cooper, Sara Denson, Michael Desai, Laurie Fennell, Laura Fields, Josh Fox, Jay Gentry, Holly Glass, Katherine Grawe, JT Grier, Mehtab Haleem, Greg Hines, Dane Honrado, K.C. Howell, Ross Kasarda, Jeannie Kim, Kristina Koutrakos, Matt Lacy, Chung Ma, Jennifer MacKnight, Curt Mattson, Moses Maxfield, Kidus Molla, Peter Murphy, Teresa Nguyen, Walker Noland, Greg Oliff, Steven Peterson, Vera Pleasants, Jummai Sarki-Hurd, Daniel Schlussler, Jenny Schoeller, Michael Scott, Viet Tran, Korey Turner, Scott Weaver, Leslie Weldon, Daniel Whitlock, and Steve Woodall.

Also in attendance was Lauren Albanese of Financial Investment News; Harrison Bader and Brigid Schutsky of BlackRock; Jamie Bitz with Joint Legislative Audit and Review Commission; Doston Bradley of Cerberus; Tom Cosmer of Pinebridge; McCyril Espanol of Pageant Media; Gary Gammon of the Virginia Auditor of Public Accounts; Emily Grimes of the Virginia Department of Planning and Budget; Rod James of WSJ; Madeline Katz of Financial Times; Gabriel Simkin, virtual attendee affiliation

unknown; Spencer Witherspoon of Schenkman Capital; and Nicholas Zizzo of SEI.

Mr. Kochard called the meeting to order at 9:03 a.m.

Mr. Kochard announced that Mr. Smyth is unable to attend the meeting and that Mr. Economou would be participating remotely in accordance with § 2.2-3708.3 of the Code of Virginia.

Mr. Kochard took a roll call of each Committee member for attendance purposes:

Mr. Beasley – present  
Mr. Economou – present  
Ms. Garson – present  
Mr. Gayner – present  
Ms. Leake – not present (entered at 9:12)  
Mr. Lewis - present  
Mr. Smyth – not present  
Mr. West - present  
Mr. Kochard – present

#### **Minutes**

A motion was made by Mr. Kochard and seconded by Mr. Beasley to approve the minutes for the April 12, 2023 Committee meeting. The motion was unanimously approved via roll call:

Mr. Beasley – aye  
Mr. Economou – aye  
Ms. Garson – aye  
Mr. Gayner – aye  
Ms. Leake – not present (entered at 9:12)  
Mr. Lewis - aye  
Mr. Smyth – not present  
Mr. West – aye  
Mr. Kochard – aye

#### **CIO Report**

Mr. Junkin opened his CIO report by commenting on market conditions, including inflation and employment, rate moves, consumer activity, and business activity for the first part of the year. Mr. Junkin then presented the Asset Allocation Report, Performance Summary, and Total Fund Tracking Error Report as of June 30, 2023. Last, Mr. Junkin reviewed the New Investments and Terminations Report.

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**Asset Liability  
Management Update**

Mr. Junkin and Mr. Lacy provided an Asset Liability Management update. Mr. Junkin began the discussion by informing the Committee that the Board of Trustees had approved the use of leverage and the proposed Strategic Asset Allocation will include leverage in two ways, rebalancing leverage and asset allocation leverage. This discussion included a projection of what contribution returns could look like with the new Strategic Asset Allocation; and concluded this portion of the discussion with a summary of the implementation plan.

Mr. Junkin turned the discussion over to Mr. Lacy who led a discussion of possible leverage options. This discussion included types of funding and the pros and cons associated with each type of funding. Also discussed was the use of liquidity stress testing to simulate how the types of leverage will impact the asset classes and the total fund.

Mr. Lacy then summarized the key takeaways from the use of leverage and stated that implementation planning is underway.

The Committee members engaged in general discussion throughout the review of leverage.

**Portfolio Solutions  
Group Program Reviews**

Mr. Ma provided a general overview of the Portfolio Solutions Group and introduced each program to be covered in the review.

Mr. Kasarda provided a review of Risk Management and the Risk-Based Investments (RBI) program. Mr. Kasarda's review topics included an overview of the team, Risk and RBI objectives, RBI mandates, performance, and forward-looking plans and priorities.

Ms. Koutrakos then provided a review of Portfolio Strategy and the Dynamic Strategies program. Review topics included an overview of the team, objectives, mandates, performance, and forward-looking plans and priorities.

The Committee members engaged in general discussion throughout the reviews provided.

Mr. Beasley made a motion to adjourn the meeting. Mr. Gayner seconded the motion. Mr. Kochard asked for the Committee members to vote on the motion, the motion was unanimously approved via roll call:

Mr. Beasley – aye  
Mr. Economou – aye  
Ms. Garson – aye

Mr. Gayner – aye  
Ms. Leake – aye  
Mr. Lewis - aye  
Mr. West – aye  
Mr. Kochard – aye

**Adjournment**

The meeting was adjourned at 10:57 a.m.

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Larry Kochard, Chairperson

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## Minutes

A meeting of the Investment Advisory Committee of the Virginia Retirement System was held on November 15, 2023 with the following members present:

Larry Kochard, joined remotely under § 2.2-3708.3(B)(4)  
Michael Beasley  
Theodore Economou  
Nancy Leake, joined remotely under § 2.2-3708.3(B)(1)  
Bryan Lewis  
Rod Smyth

The following Board members were present:

A. Scott Andrews  
Brandon Bell  
John Bennett  
Michael Disharoon  
Jessica Hood

The following staff members were in attendance:

Trish Bishop, Andrew Junkin, Jennifer Schreck, Stephen Adelaar, John Alouf, Rory Badura, Daniel Ball, Parham Behrooz, Jeanne Chenault, Tom Coleman, Michael Cooper, Perry Corsello, Sara Denson, Laurie Fennell, Laura Fields, Antonio Fisher, Josh Fox, Jay Gentry, Holly Glass, Katherine Grawe, JT Grier, Mehtab Haleem, K.C. Howell, Jeannie Kim, Kristina Koutrakos, Chung Ma, Jennifer MacKnight, Curt Mattson, Tom Mulvin, Walker Noland, Mark Rein, Jummai Sarki-Hurd, Daniel Schlusser, Jenny Schoeller, Kristy Scott, Michael Scott, Korey Turner, Daniel Whitlock, Cindy Wilkinson, Steve Woodall, and Olga Zozulya.

Also in attendance was Lauren Albanese of Financial Investment News; Harrison Bader and Brigid Schutsky of BlackRock; Jamie Bitz with the Virginia Joint Legislative Audit and Review Commission; Doston Bradley of Cerberus; McCyril Espanol of Pageant Media; Dillon Gravenstone and Alec Ostrowidski of Goldman Sachs; Hudson Miller, affiliation unknown; Erin Rodriguez and Amy Stokes of the Virginia Auditor of Public Accounts; Gabriel Simkin, affiliation unknown; and John Zilko of Antares.

Mr. Kochard called the meeting to order at 9:00 a.m.

Mr. Kochard announced that Ms. Garson, Mr. Gayner, and Mr. West were unable to attend the meeting.

Mr. Kochard further announced that he, under code section § 2.2-3708.3(B)(4), and Ms. Leakes, under code section § 2.2-3708.3(B)(1), would be participating remotely in accordance with the Code of Virginia.

Mr. Kochard took a roll call of each Committee member for attendance purposes:

Mr. Beasley – present  
Mr. Economou – present  
Ms. Leake – present  
Mr. Lewis – not present, entered the meeting at 9:02 a.m.  
Mr. Smyth – present  
Mr. Kochard – present

#### **Minutes**

Mr. Kochard noted that there is no physical quorum of Investment Advisory Committee members so the minutes from the August 23, 2023 Committee meeting will not be approved during this meeting.

#### **CIO Report**

Mr. Junkin opened his CIO report by commenting on current market conditions. Mr. Junkin then presented the Asset Allocation Report, Performance Summary, and Total Fund Tracking Error Report as of September 30, 2023. Last, Mr. Junkin reviewed the New Investments and Terminations Report.

#### **Asset Liability Management Update**

Mr. Ma provided an update on Asset Liability Management. Mr. Ma stated the new Asset Allocation is expected to launch in January 2024. Mr. Ma discussed the roadmap to launch, on which management is at the point of finalizing new policies ahead of the launch; as well as reiterated the expected glide path to achieving the new allocation policy weights. Mr. Ma also discussed possible funding sources, dynamic scenario and stress testing tools, and key takeaways to support the new Asset Allocation.

Mr. Ma also presented proposed updates to the VRS Defined Benefit Plan Investment Policy Statement, including the Appendix 1, the VRS Investment Belief Statements, and the new VRS Investment Leverage Policy. The Committee expressed their agreement with the proposed updates and new document. The documents were presented for approval at a subsequent VRS Board of Trustees meeting.

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**Private Market Assets  
Program Reviews**

Mr. Howell provided a general overview of Private Market Assets and introduced each program to be covered in the review.

Mr. Noland provided a review of the Real Assets program. Review topics included an overview of program objectives, the team, markets, exposures, results, manager breakout including top 10 investment managers and Diverse Investment Management Engagement managers, commitments made for the period ending June 30, 2023, and forward-looking plans and priorities.

Mr. Alouf provided a review of the Private Equity program. Review topics included an overview of the team, markets, exposures, results, manager breakout including top 10 investment managers and Diverse Investment Management Engagement managers, and forward-looking plans and priorities.

Mr. Woodall provided a review of the Credit Strategies program. Review topics included an overview of the program objective, the team, asset allocation, markets, exposures, results, co-investments approach, manager breakout including top 10 investment managers and FY 2023 hires and terminations, and forward-looking plans and priorities.

The Committee members engaged in general discussion throughout the reviews provided.

**Adjournment**

Because there was no physical quorum, a motion is not necessary to adjourn the meeting.

The meeting was adjourned at 11:18 a.m.

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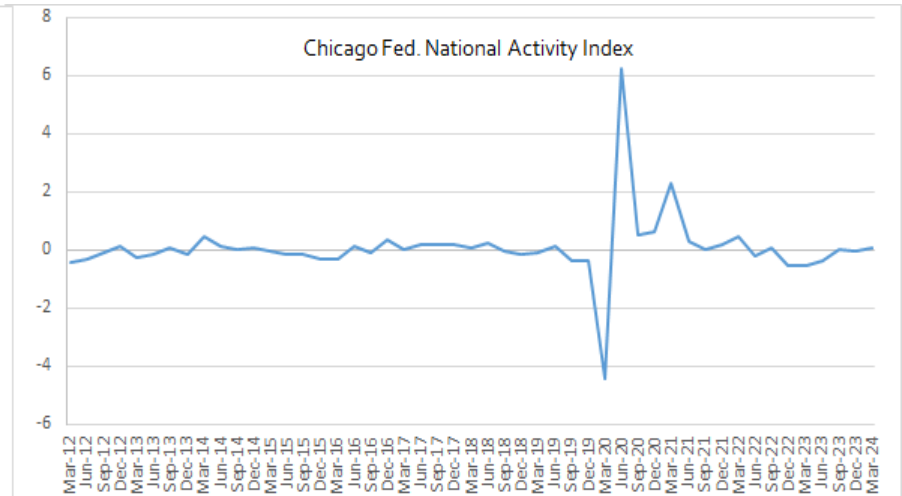
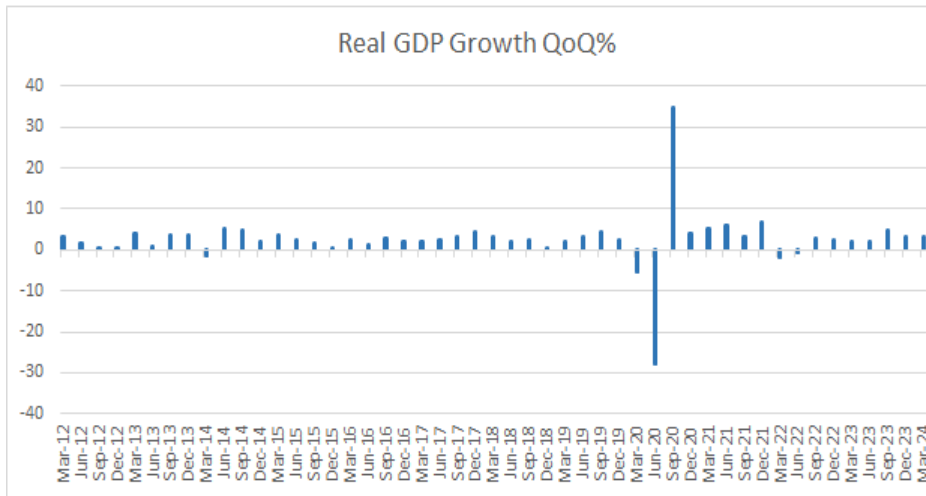
Larry Kochard, Chairperson



# Chief Investment Officer Report Market Review – April 2024 Andrew Junkin

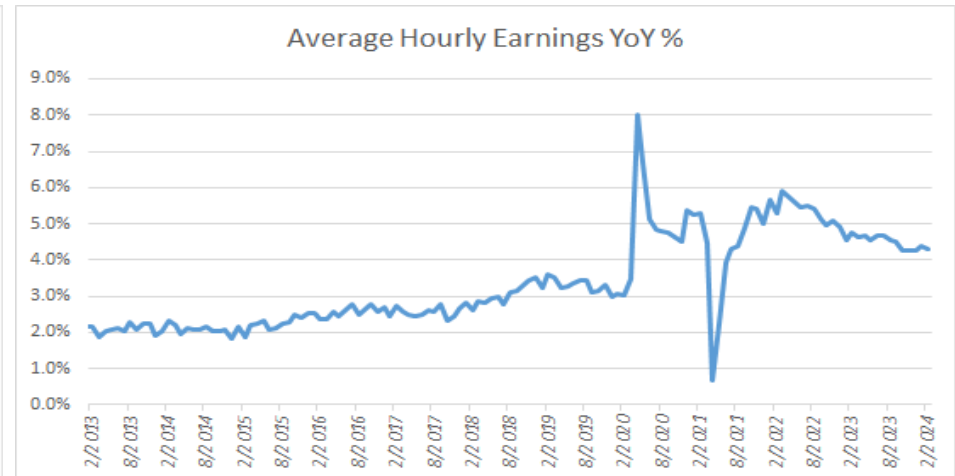
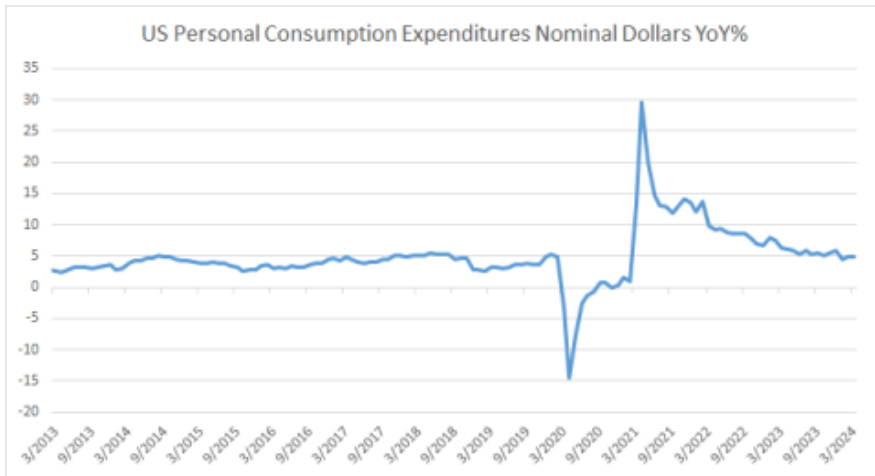
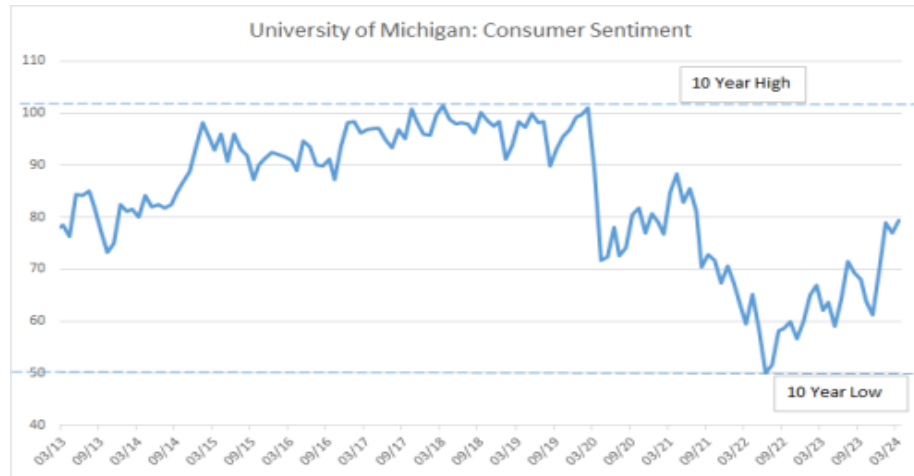


# Economic Growth - Quarterly



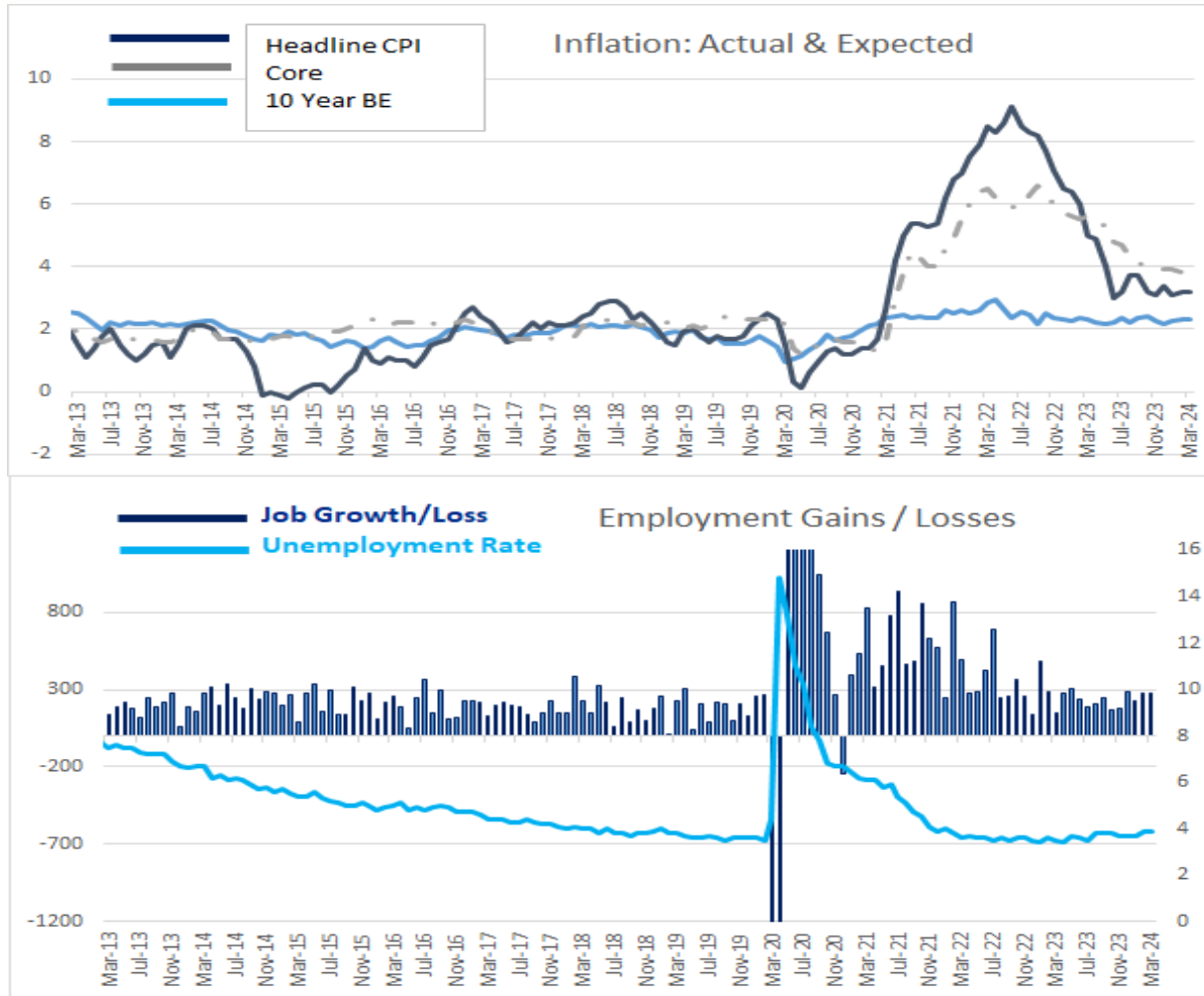
Data Source: Bloomberg

# Consumer Activity



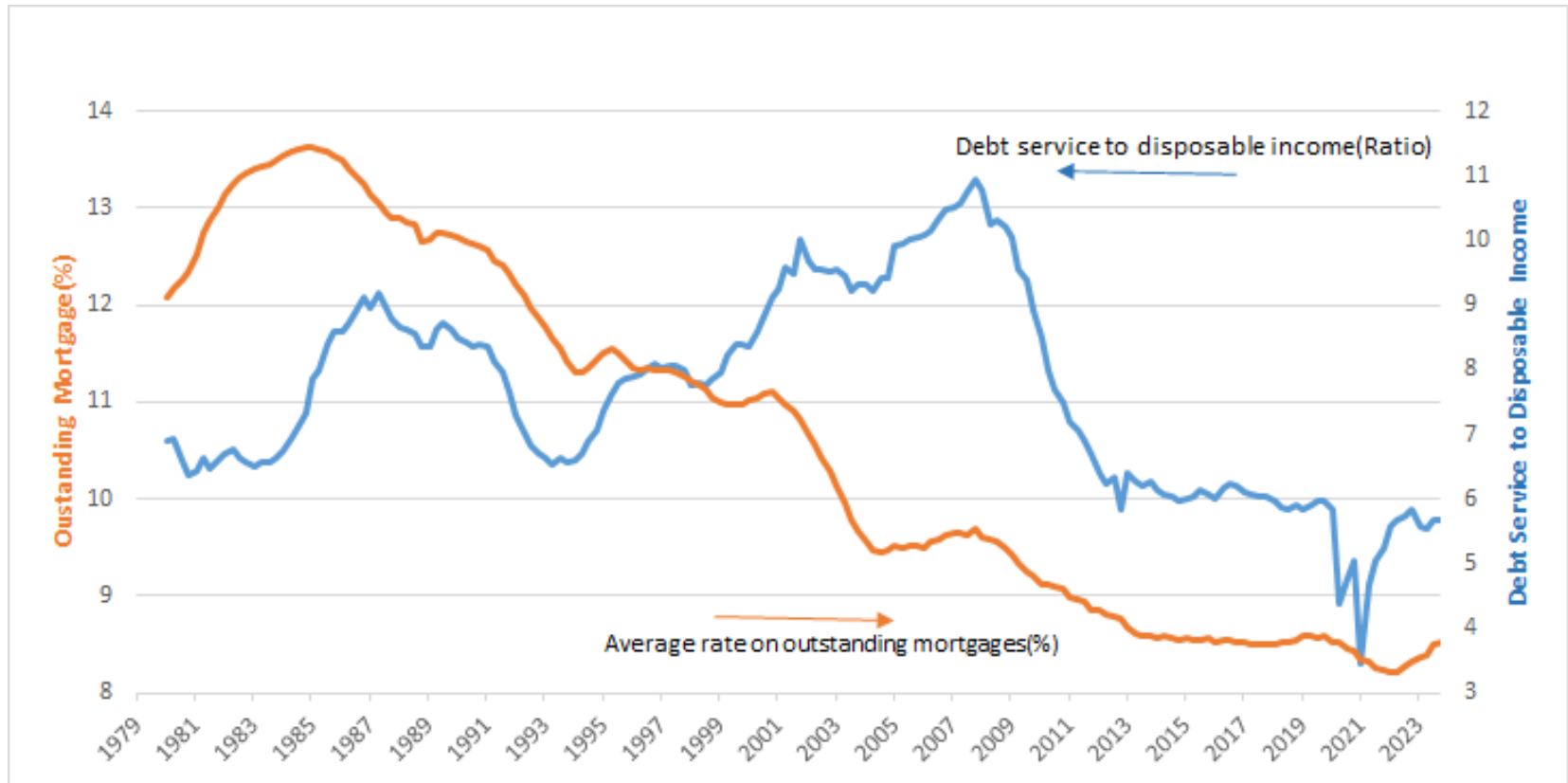
Data Source: Bloomberg

# Inflation and Employment



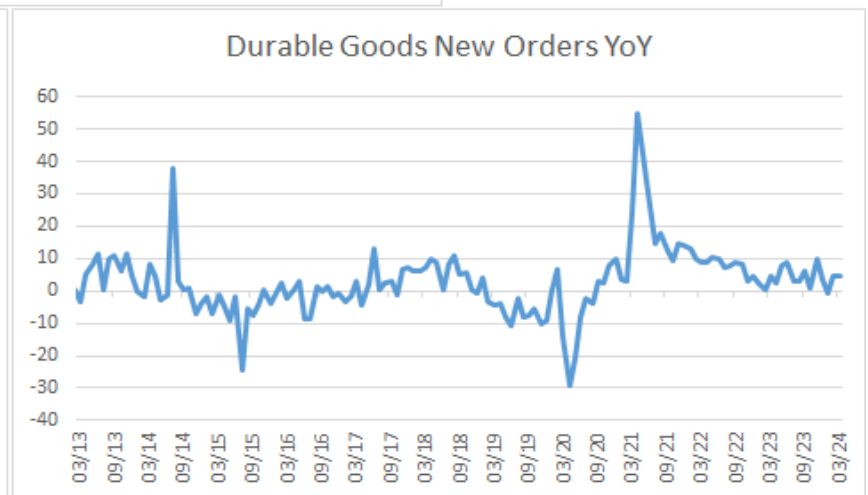
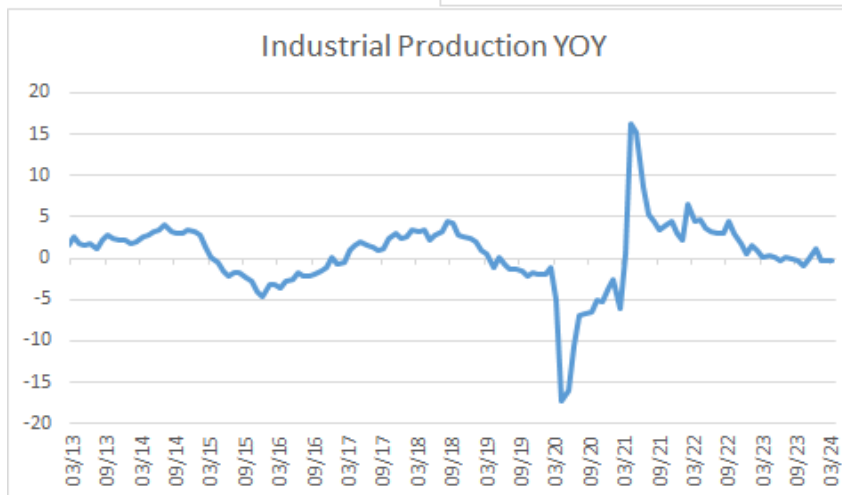
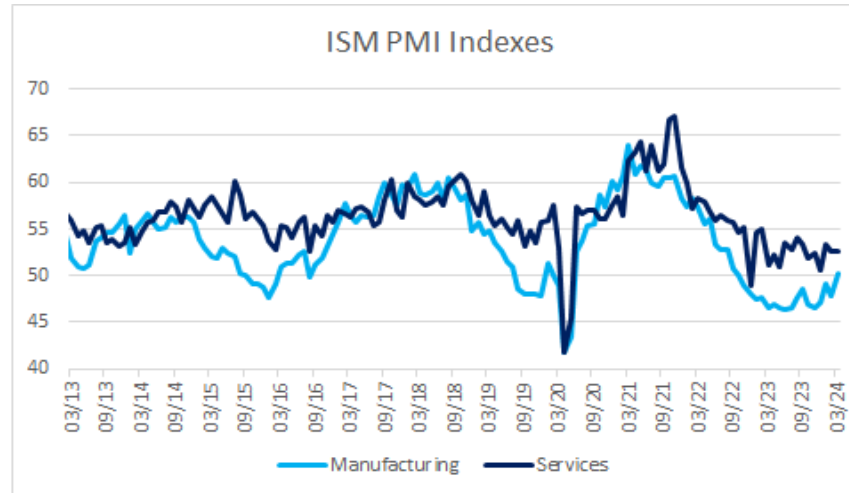
Data Source: Bloomberg

# US Household Debt

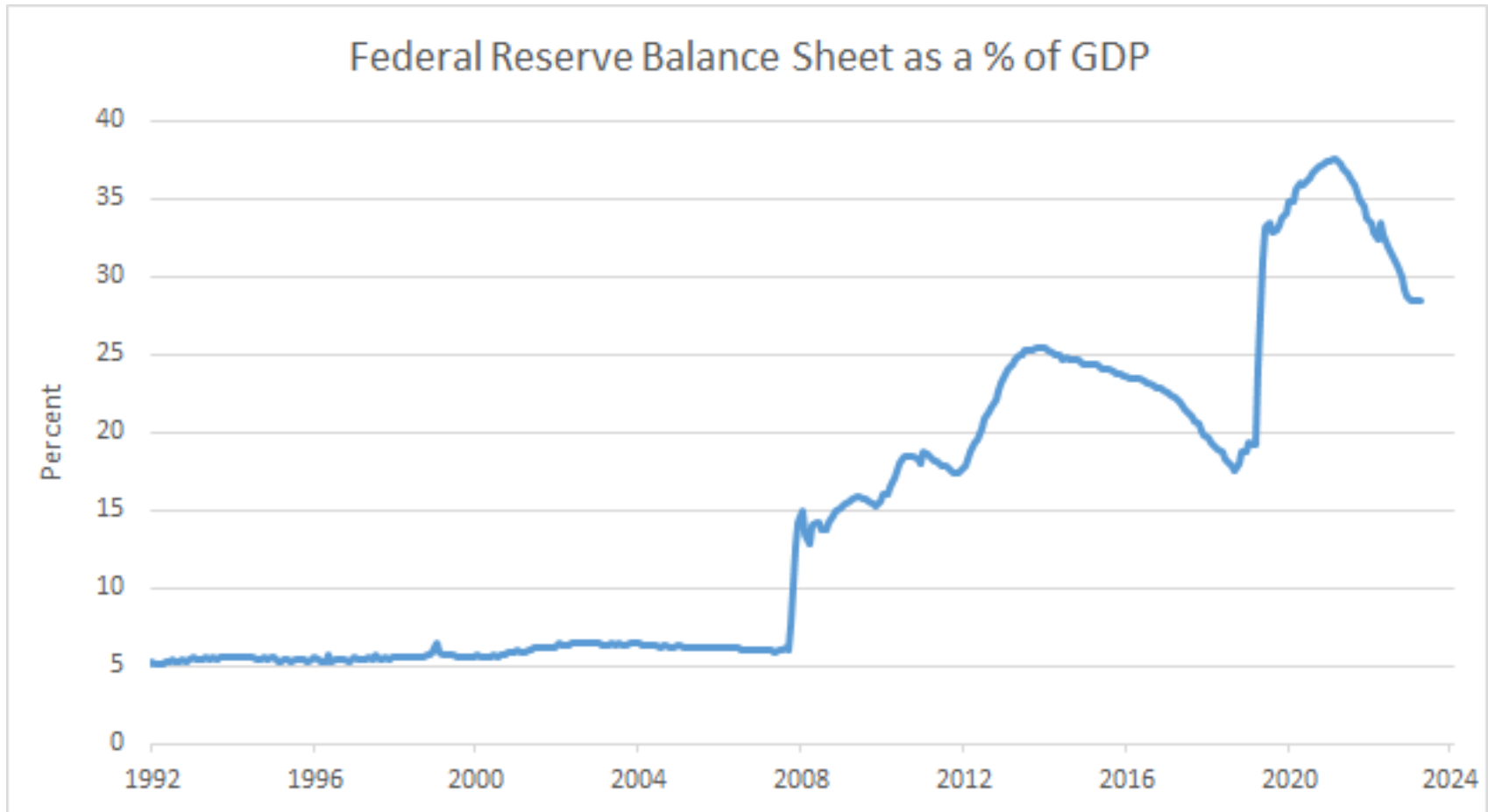


Data Source: Bloomberg, updated quarterly

# Business Activity



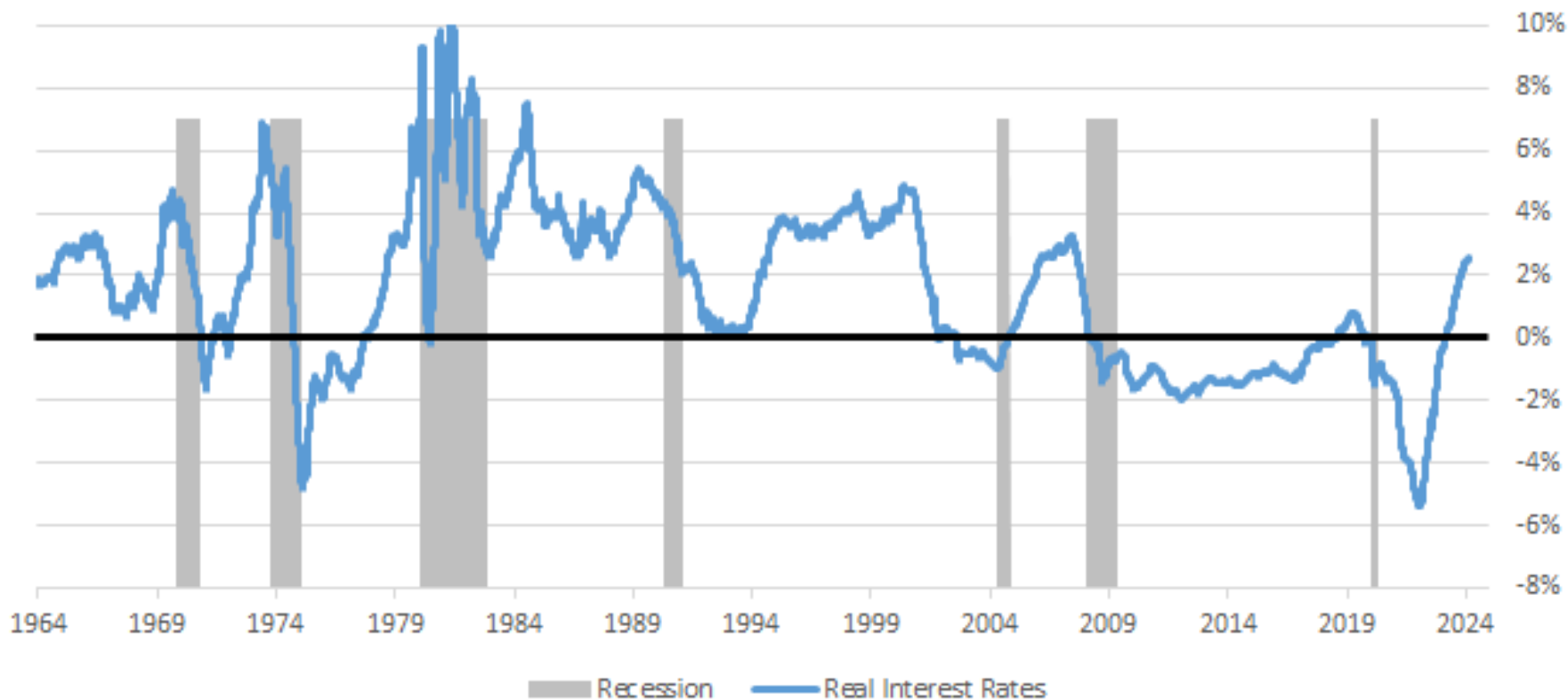
Data Source: Bloomberg



Data Source: Bloomberg

# Higher Real Cost of Money

Real Interest Rates (FED Funds-Core CPI), 21 day smoothing

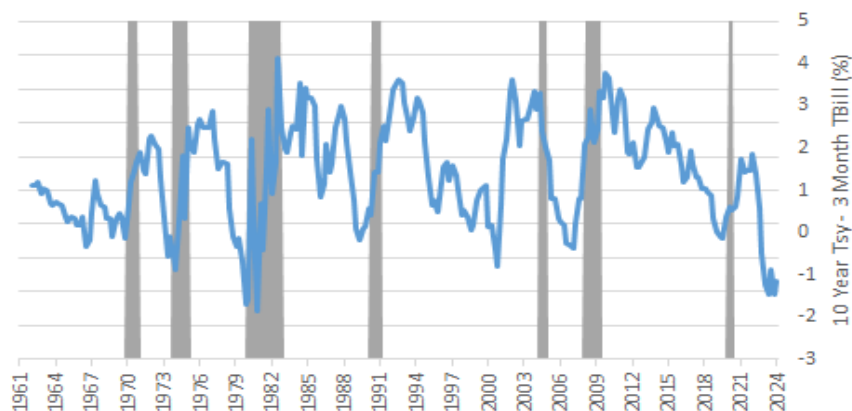


Data Source: Bloomberg

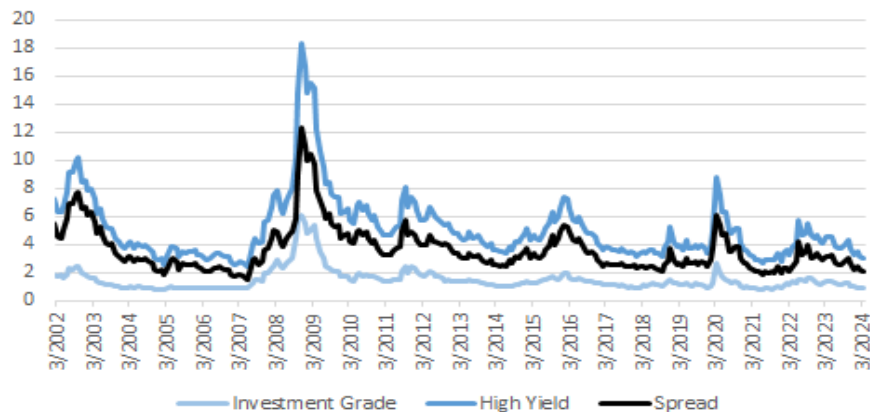


# Risk Monitor

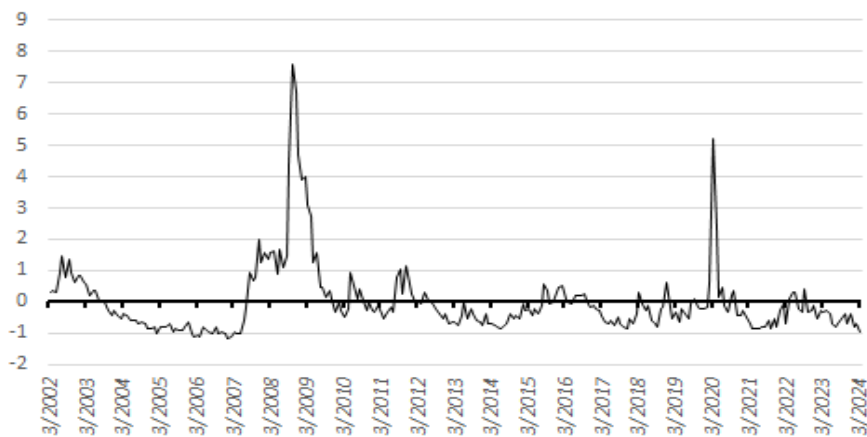
### Yield Curve Slope vs Recessions



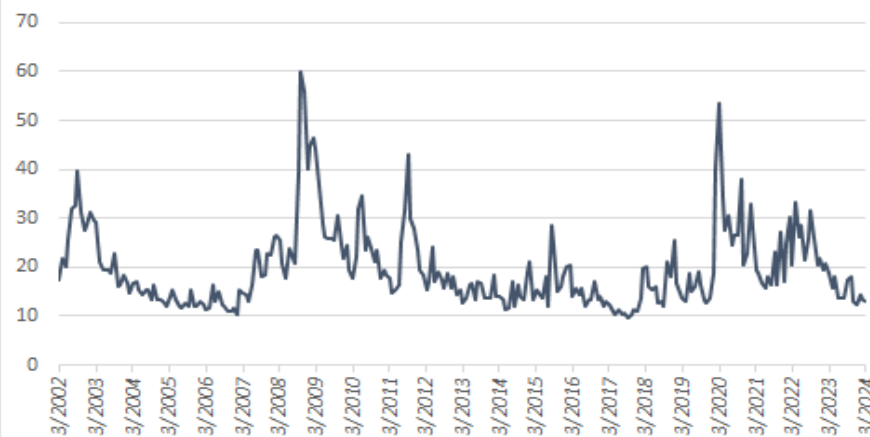
### Credit Benchmarks



### St Louis Fed Financial Stress Index

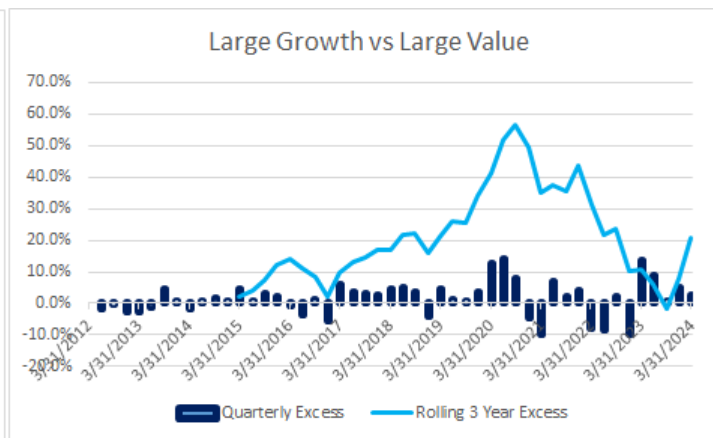
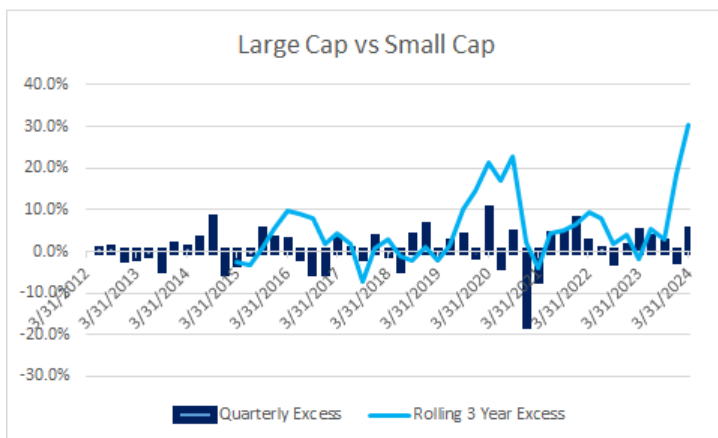


### CBOE Volatility Index



Data Source: Bloomberg

3/31/2024	3 Months	YTD	1 Year	3 Year	5 Year	10 Year
Russell 1000	10.99%	10.99%	29.85%	10.44%	14.47%	12.67%
Russell 2000	5.92%	5.92%	19.66%	-0.14%	7.84%	7.55%
Russell 3000	10.71%	10.71%	29.28%	9.76%	14.05%	12.32%
Russell 1000 Value	8.59%	8.59%	20.24%	8.08%	10.03%	8.99%
Russell 1000 Growth	13.07%	13.07%	38.99%	12.50%	18.24%	15.98%
Russell 2000 Value	3.24%	3.24%	18.69%	2.17%	7.83%	6.85%
Russell 2000 Growth	8.76%	8.76%	20.31%	-2.71%	7.19%	7.87%
MSCI US Min Vol	7.54%	7.54%	16.03%	7.71%	8.59%	10.30%
FTSE RAFI US 1000 Index	9.86%	9.86%	25.57%	10.79%	13.60%	11.21%

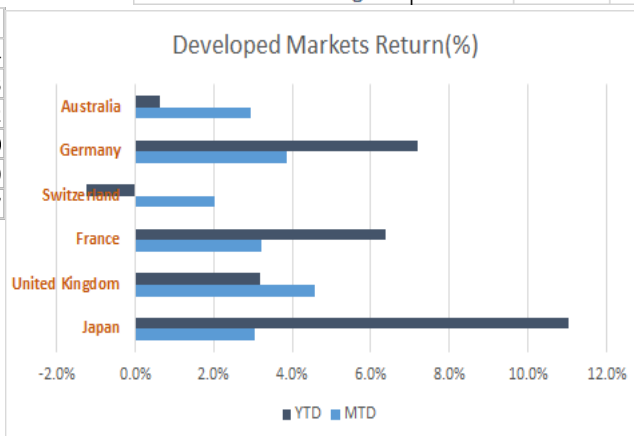


Data Source: Bloomberg

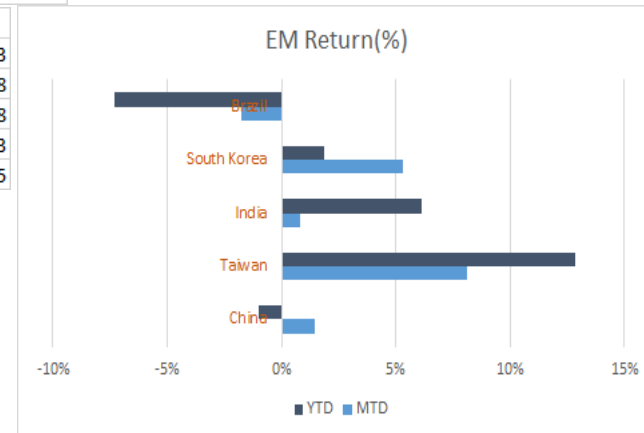
# Non-U.S. Equity Markets

3/31/24	3 Months	6 Months	1 Year	3 Year	5 Year	10 Year
MSCI ACWI ex US	4.78%	16.51%	13.83%	2.48%	6.28%	4.81%
MSCI EAFE Dev	5.94%	18.81%	15.94%	5.40%	7.70%	5.40%
MSCI Emerging	2.32%	10.67%	8.50%	-4.73%	2.33%	3.32%
MSCI Frontier	5.59%	14.42%	15.84%	2.73%	0.69%	0.60%
MSCI ACWI ex US Growth	5.94%	19.13%	11.56%	-0.45%	6.40%	5.49%
MSCI ACWI ex US Value	3.57%	13.89%	16.16%	5.37%	5.83%	3.91%
MSCI ACWI ex US Small Cap	2.10%	14.06%	13.31%	0.83%	6.44%	5.14%
MSCI ACWI Min Vol	4.82%	12.52%	11.70%	4.81%	6.00%	7.84%
MSCI EAFE Min Vol	2.36%	11.22%	8.80%	2.08%	2.91%	4.72%
FTSE RAFI x-US 1000 ETF	6.33%	17.57%	17.78%	6.74%	7.87%	4.86%
MSCI EAFE US Dollar Hedged	10.49%	18.02%	22.36%	11.95%	11.39%	9.25%
MSCI EM US Dollar Hedged	4.35%	10.30%	10.71%	-2.90%	3.83%	4.61%

Country	Weight
Japan	24
United Kingdom	13
France	12
Switzerland	10
Germany	9
Australia	7



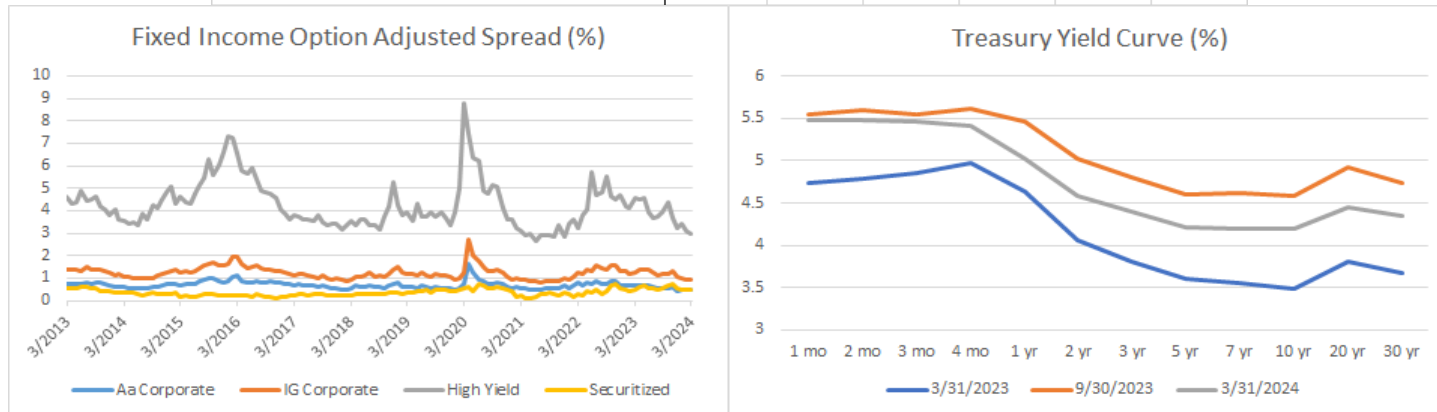
Country	Weight
China	23
Taiwan	18
India	18
South Korea	13
Brazil	5



Data Source: Bloomberg(Dev – MXEA Index, EM – MXEF Index)

# U.S. Fixed Income

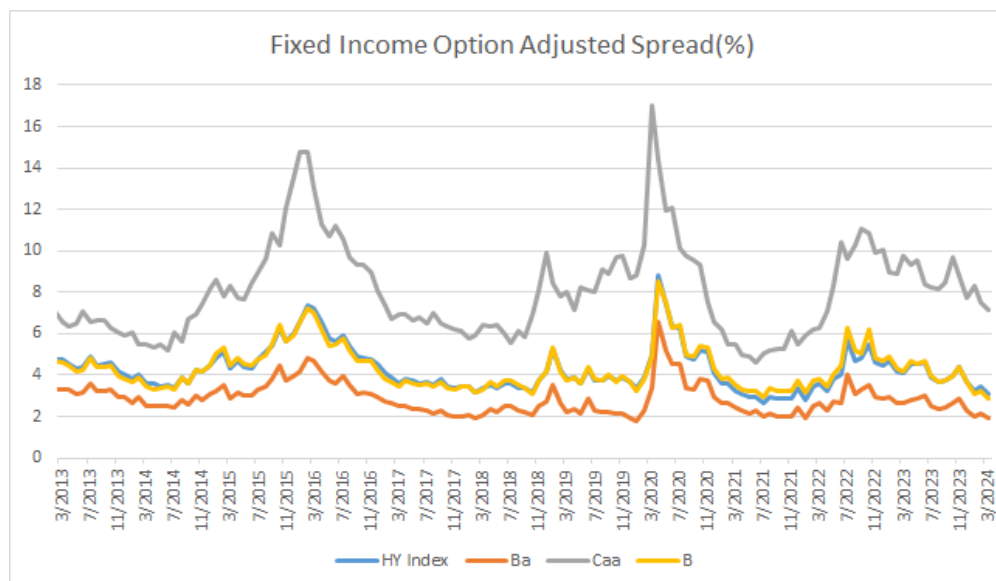
3/31/2024	3 Months	6 Months	1 Year	3 Year	5 Year	10 Year
Bloomberg US Agg	-0.27%	6.72%	1.70%	-2.46%	0.44%	1.54%
Bloomberg US Tsy Unhedged	-0.56%	5.24%	0.05%	-2.73%	0.00%	1.03%
Bloomberg US Gov Related Unhedged	0.07%	5.57%	2.49%	-1.60%	0.79%	1.74%
Bloomberg US Securitized	-0.35%	7.23%	1.61%	-2.71%	-0.20%	1.18%
Bloomberg US Corporate	0.25%	8.88%	4.43%	-1.87%	1.61%	2.61%
Bloomberg US Credit	-1.42%	12.11%	-1.15%	-6.04%	-0.43%	2.32%
Bloomberg US Long Tsy Unhedged	-2.40%	10.72%	-6.08%	-8.04%	-2.54%	1.25%
Bloomberg US Agg Long Tsy Unhedged	-0.35%	10.98%	2.12%	-4.06%	0.08%	2.74%
Bloomberg US Long Corporate Unhedged	-0.57%	13.65%	3.43%	-4.29%	1.10%	3.11%
Bloomberg US Inflation Unhedged	0.19%	5.29%	0.45%	-0.53%	2.55%	2.21%
Bloomberg US Corporate High Yield Unhedged	1.91%	9.30%	11.15%	2.19%	4.17%	4.44%
LSTA US Leveraged	2.46%	5.40%	12.47%	5.99%	5.48%	4.55%
3 - Month T Bill	1.29%	2.68%	5.24%	2.58%	2.02%	1.38%



Data Source: Bloomberg

# High Yield Bond Market

3/31/2024	3 Months	6 Months	1 Year	3 Year	5 Year	10 Year
Bloomberg US Corporate HY	1.91%	9.30%	11.15%	2.19%	4.17%	4.44%
LSTA Leveraged Loan Index	0.52%	1.22%	3.59%	-0.28%	0.07%	-0.20%
Bloomberg Ba US HY	1.57%	9.13%	9.11%	1.79%	4.53%	4.82%
Bloomberg B US HY	1.78%	9.00%	11.46%	2.36%	3.94%	4.08%
Bloomberg Caa US HY	2.61%	9.77%	16.63%	2.42%	3.01%	3.88%
Bloomberg Ca to D US HY	13.94%	19.80%	36.71%	5.05%	2.97%	-2.67%

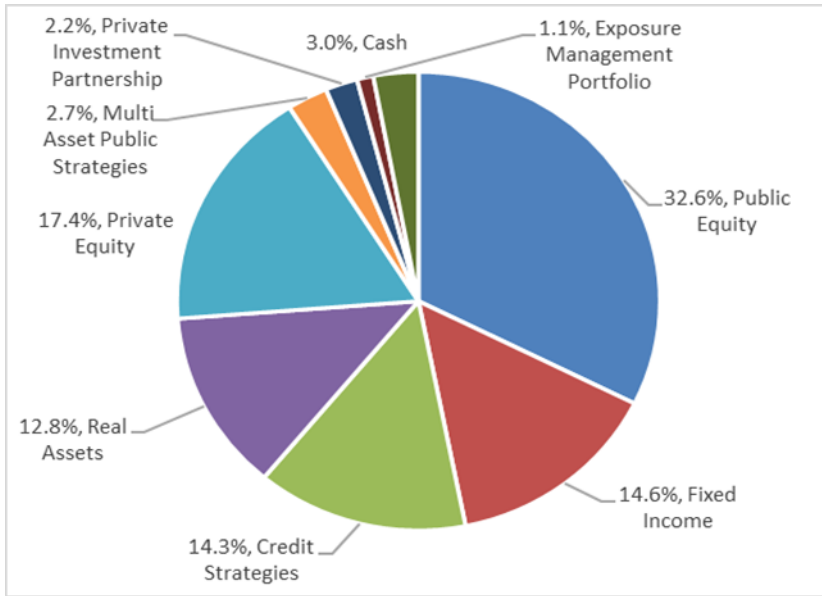


Data Source: Bloomberg

# Asset Allocation Report

## January 31, 2024

For Internal Investment Purposes Only



Tracking Error	
3Yr-Total Fund:	<b>2.60%</b>
3Yr-Total Public:	<b>1.84%</b>
5Yr-Total Fund:	<b>2.29%</b>
5Yr-Total Public:	<b>1.60%</b>

	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>		<u>Internal %</u>
Total Fund (Gross Market Value)	110.3	100.6%	101.0%	-0.4%			
Leverage	-0.7	-0.6%	-1.0%	0.4%	-3%	0%	
Total Fund (Net Market Value)	<b>109.6</b>	<b>100.0%</b>	<b>100.0%</b>	0.0%			30.6%

Public Equity	35.7	32.6%	33.0%	-0.4%	26%	40%	51.9%
Fixed Income	16.0	14.6%	16.0%	-1.4%	12%	23%	95.6%
Credit Strategies	15.6	14.3%	14.0%	0.3%	7%	21%	
Real Assets	14.1	12.8%	14.0%	-1.2%	7%	21%	
Private Equity	19.0	17.4%	16.0%	1.4%	9%	23%	
MAPS	3.0	2.7%	4.0%	-1.3%	1%	9%	
PIP	2.4	2.2%	2.0%	0.2%	0%	4%	
EMP	1.2	1.1%	0.0%	1.1%	0%	6%	
Cash	3.3	3.0%	2.0%	1.0%	0%	7%	

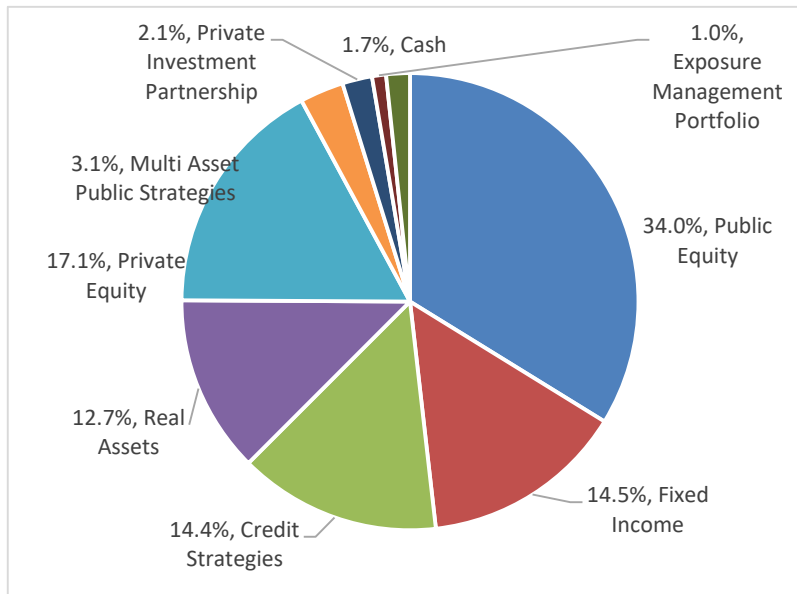
<u>High-Level Exposure</u>	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>	
<b>Total Equity</b>	<b>54.7</b>	<b>49.9%</b>	<b>49.0%</b>	<b>0.9%</b>	<b>39%</b>	<b>59%</b>
<b>Fixed Income + Cash</b>	<b>19.3</b>	<b>17.6%</b>	<b>18.0%</b>	<b>-0.4%</b>	<b>12%</b>	<b>27%</b>

- Total Fund includes the following amt held by the Treasurer of VA: \$ 459 million
- The values shown for each asset class on this report may reflect adjustments related to derivative positions in the Rebalance Account, pending transactions and certain accruals, in order to provide a more descriptive representation of the true economic exposure to each asset class ( 6 adjustments applied )
- Total Fund and Total Public annualized tracking error is calculated using compounded quarterly returns as of 12/31/2023
- Differences in totals are due to rounding.

# Daily Asset Allocation Report

April 03, 2024

For Internal Investment Purposes Only



Tracking Error	
3Yr-Total Fund:	<b>2.60%</b>
3Yr-Total Public:	<b>1.84%</b>
5Yr-Total Fund:	<b>2.29%</b>
5Yr-Total Public:	<b>1.60%</b>

	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>	<u>Internal %</u>
Total Fund (Gross Market Value)	112.2	100.6%	101.0%	-0.4%		
Leverage	-0.7	-0.6%	-1.0%	0.4%	-3% 0%	
<b>Total Fund (Net Market Value)</b>	<b>111.5</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>		31.5%

Public Equity	37.9	34.0%	33.0%	1.0%	26%	40%	52.7%
Fixed Income	16.2	14.5%	16.0%	-1.5%	12%	23%	95.2%
Credit Strategies	16.1	14.4%	14.0%	0.4%	7%	21%	
Real Assets	14.1	12.7%	14.0%	-1.3%	7%	21%	
Private Equity	19.1	17.1%	16.0%	1.1%	9%	23%	
Multi Asset Public Strategies	3.5	3.1%	4.0%	-0.9%	1%	9%	
Private Investment Partnership	2.4	2.1%	2.0%	0.1%	0%	4%	
Exposure Management Portfolio	1.1	1.0%	0.0%	1.0%	0%	6%	
Cash	1.9	1.7%	2.0%	-0.3%	0%	7%	

<u>High-Level Exposure</u>	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>
Total Equity	57.0	51.1%	49.0%	2.1%	39% 59%
Fixed Income + Cash	18.0	16.2%	18.0%	-1.8%	12% 27%

- Total Fund includes the following amt held by the Treasurer of VA: \$ 82 million
- The values shown for each asset class on this report may reflect adjustments related to derivative positions in the Rebalance Account, pending transactions and certain accruals, in order to provide a more descriptive representation of the true economic exposure to each asset class ( 1 adjustments applied )
- Total Fund and Total Public annualized tracking error is calculated using compounded quarterly returns as of 12/31/2023
- Differences in totals are due to rounding.

**PERFORMANCE SUMMARY**

**Rolling Periods Ending**

**January 31, 2024**



**TOTAL FUND PERFORMANCE**

*(Net of Fees)*

	10 Yr	5 Yr	3 Yr	1 Yr	Qtr	Month	Fiscal YTD	Cal YTD	Market Value (\$MM)
<b>Total Public Equity Strategies</b>	<b>8.5</b>	<b>9.9</b>	<b>7.2</b>	<b>14.4</b>	<b>15.8</b>	<b>1.3</b>	<b>9.4</b>	<b>1.3</b>	<b>34,781</b>
<i>Benchmark</i>	8.5	10.1	6.1	14.3	15.7	0.5	8.1	0.5	
<b>Total Fixed Income</b>	<b>2.5</b>	<b>2.1</b>	<b>-2.3</b>	<b>3.0</b>	<b>8.5</b>	<b>-0.2</b>	<b>3.6</b>	<b>-0.2</b>	<b>14,997</b>
<i>Benchmark</i>	1.7	1.0	-3.0	2.6	8.3	-0.3	3.4	-0.3	
<b>Total Credit Strategies</b>	<b>6.2</b>	<b>7.3</b>	<b>6.7</b>	<b>10.6</b>	<b>3.4</b>	<b>0.3</b>	<b>6.6</b>	<b>0.3</b>	<b>15,669</b>
<i>Benchmark</i>	5.0	5.4	3.8	10.2	5.9	0.4	7.4	0.4	
<b>Total Real Assets</b>	<b>9.2</b>	<b>7.3</b>	<b>9.5</b>	<b>-2.7</b>	<b>0.0</b>	<b>-0.2</b>	<b>-0.9</b>	<b>-0.2</b>	<b>14,058</b>
<i>Benchmark</i>	6.9	4.9	5.9	-6.5	-1.5	-1.0	-3.0	-1.0	
<b>Total Private Equity</b>	<b>15.2</b>	<b>15.9</b>	<b>16.8</b>	<b>6.1</b>	<b>-0.4</b>	<b>-0.1</b>	<b>1.8</b>	<b>-0.1</b>	<b>19,017</b>
<i>Benchmark</i>	9.6	8.9	7.0	10.1	-9.8	-3.1	-0.7	-3.1	
<b>Total Private Investment Partnerships</b>	<b>n/a</b>	<b>8.9</b>	<b>12.8</b>	<b>7.0</b>	<b>2.0</b>	<b>0.0</b>	<b>3.7</b>	<b>0.0</b>	<b>2,382</b>
<i>Benchmark</i>	n/a	6.9	6.6	4.0	-2.0	-1.3	1.0	-1.3	
<b>Total Multi-Asset Public Strategies</b>	<b>n/a</b>	<b>5.3</b>	<b>4.3</b>	<b>7.3</b>	<b>5.1</b>	<b>0.7</b>	<b>4.6</b>	<b>0.7</b>	<b>2,994</b>
<i>Benchmark</i>	n/a	6.2	3.2	9.0	6.7	0.6	5.7	0.6	
<b>Total Fund</b>	<b>7.9</b>	<b>8.8</b>	<b>7.6</b>	<b>7.7</b>	<b>6.7</b>	<b>0.4</b>	<b>5.1</b>	<b>0.4</b>	<b>109,577</b>
<i>VRS Custom Benchmark</i>	6.7	7.0	4.5	8.1	5.6	-0.5	4.3	-0.5	

Effective July 2013, the VRS Custom Benchmark is a blend of the Asset Class Benchmarks at policy weights.

Effective January 2024, the Total Fund includes leverage.

The VRS Cash Account, the Treasurer Short-Term Investment Account, the VRS Rebalancing Account, transition activity and accounts with market values of less than \$1 million are included in the Total Fund's market value. Differences in market value totals are due to rounding.

**Leverage Cost Measurement Information**

*(Information provided for purposes of monitoring the cost effectiveness of leverage implementation.)*

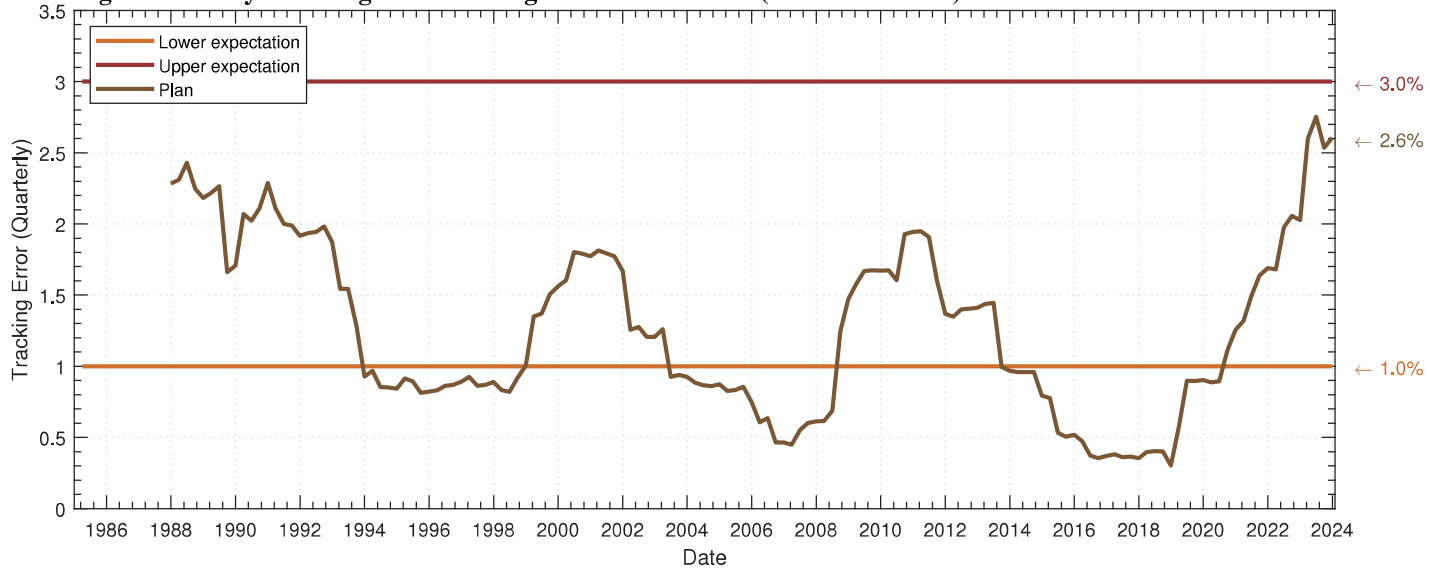
	10 Yr	5 Yr	3 Yr	1 Yr	Qtr	Month	Fiscal YTD	Cal YTD	Market Value (\$MM)
<b>Leverage</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>n/a</b>	<b>0.2</b>	<b>n/a</b>	<b>0.2</b>	<b>(701)</b>
<i>Benchmark</i>	n/a	n/a	n/a	n/a	n/a	0.5	n/a	0.5	

Effective January 2024, the Leverage Custom Benchmark is the Secured Overnight Financing Rate (SOFR) plus 50 basis points per annum.

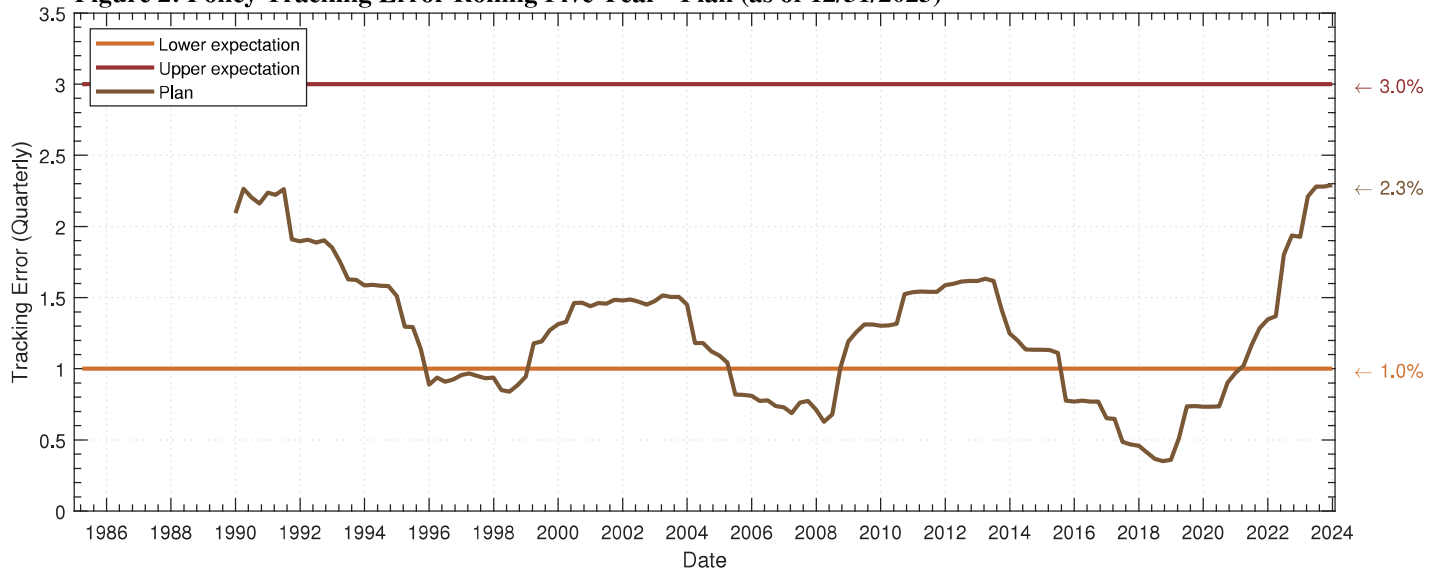


# Total Fund Tracking Error

**Figure 1: Policy Tracking Error Rolling Three Year - Plan (as of 12/31/2023)**



**Figure 2: Policy Tracking Error Rolling Five Year - Plan (as of 12/31/2023)**



The VRS Defined Benefit Plan Investment Policy Statement established the total fund tracking error range as the allowable observed tracking error calculated quarterly using 5 years of history.

Program	Action	Effective Date	Commitment/Current Value	Funding/Defunding Period	Description
Credit Strategies	Hired	11/22/2023	\$200 million	4 years	<b>Ares Credit Secondaries</b> – A closed-end fund investing in a diversified portfolio of secondary credit fund interests.
Credit Strategies	Terminated	12/29/2023	\$135 Million	1 year	<b>Solus Core Opportunities</b> –An opportunistic credit strategy.
Real Assets	Hired	12/22/2023	\$100 Million	4 years	<b>DigitalBridge Partners Fund III</b> – An infrastructure fund that targets digital infrastructure on a global basis.
Real Assets	Hired	01/09/2024	\$200 Million	5 years	<b>PGIM Energy Lending Separate Account</b> – A separate account focused on North American oil and gas lending.
Real Assets	Hired	02/06/2024	\$100 Million	Immediate	<b>USEF Sailfish Venture</b> – A preferred equity investment in U.S. real estate.
Real Assets	Hired	04/02/2024	\$200 Million	5 Years	<b>Stonepeak Infrastructure Partners Fund V</b> – A U.S. focused closed-end infrastructure fund.
Public Equity	Hired	12/01/2023	\$500 Million	Immediate	<b>WCM Global Growth</b> – A long-only equity strategy.
Public Equity	Opened	01/02/2024	\$5.5 Billion	Immediate	<b>Bearfence</b> – An internally managed global low volatility equity strategy.
Public Equity	Closed	01/02/2024	\$1.6 Billion	Immediate	<b>Piedmont</b> – An internally managed developed non-U.S. low volatility strategy.
Public Equity	Closed	01/02/2024	\$3.4 Billion	Immediate	<b>Mobjack</b> - An internally managed U.S. low volatility strategy.
Public Equity	Terminated	12/29/2023	\$144 Million	Immediate	<b>Taiyo Fund, LP</b> – A Japanese equity activist fund.
Public Equity	Terminated	01/31/2024	\$224 Million	Immediate	<b>Arisaig</b> – An emerging market consumer-oriented strategy.

\* The manager is considered Diverse Investment Management Engagement (DIME) under the Commonwealth of Virginia definition, which defines ownership threshold of 51% or more.

**VRS Investment Department**

Recap of New Investments/Terminations

Time Period: 11/16/2023 – 04/10/2024



Program	Action	Effective Date	Commitment/Current Value	Funding/Defunding Period	Description
Dynamic Strategies	Terminated	12/29/2023	\$118 Million	Immediate	<b>BlackRock Shenandoah</b> – An internally directed global asset allocation strategy.
Dynamic Strategies	Terminated	12/29/2023	\$2 Million	Immediate	<b>Shenandoah AQR Market Neutral</b> - A market neutral strategy investing in value equities.
Dynamic Strategies	Terminated	12/29/2023	\$80 Million	Immediate	<b>MetLife Climate Aware Fixed Income</b> – A long-only, multi-asset fixed income strategy emphasizing climate-readiness.
Dynamic Strategies	Terminated	12/29/2023	\$51 Million	Immediate	<b>Nordea Global Climate &amp; Environment</b> – A long-only global equity mandate focused on opportunities resulting from climate change.
Dynamic Strategies	Terminated	12/29/2023	\$46 Million	Immediate	<b>Schroders Global Climate Change</b> – A long-only global equity mandate investing across a variety of climate-related themes.
Dynamic Strategies	Terminated	12/29/2023	\$117 Million	Immediate	<b>Wellington Emerging Market Development</b> – A targeted emerging market equity strategy investing around economic development themes.
Dynamic Strategies	Terminated	12/29/2023	\$762 Million	Immediate	<b>BlackRock Global Tactical Asset Allocation</b> – A multi-asset, public market mandate designed to add alpha through the management of asset class exposures.
Dynamic Strategies	Terminated	12/29/2023	\$631 Million	Immediate	<b>JPMorgan Global Tactical Asset Allocation</b> - A multi-asset, public market mandate designed to add alpha through the management of asset class exposures.
Dynamic Strategies	Hired	01/05/2024	\$700 Million	Immediate	<b>VRS BLK Global Dynamic Allocation Strategy Fund LLC</b> - A multi-asset absolute return portfolio.
Dynamic Strategies	Hired	02/01/2024	\$350 Million	Immediate	<b>MAS Global Dynamic Allocation Strategy Fund LLC</b> - A multi-asset absolute return portfolio.
Total Fund	Implemented	01/01/2024	N/A	N/A	<b>VRS Asset Allocation Leverage</b> - Staff implemented the Board approved Asset Allocation Leverage.

\* The manager is considered Diverse Investment Management Engagement (DIME) under the Commonwealth of Virginia definition, which defines ownership threshold of 51% or more.



Virginia  
Retirement  
System

# Leverage Implementation Update

Andrew Junkin  
Chief Investment Officer

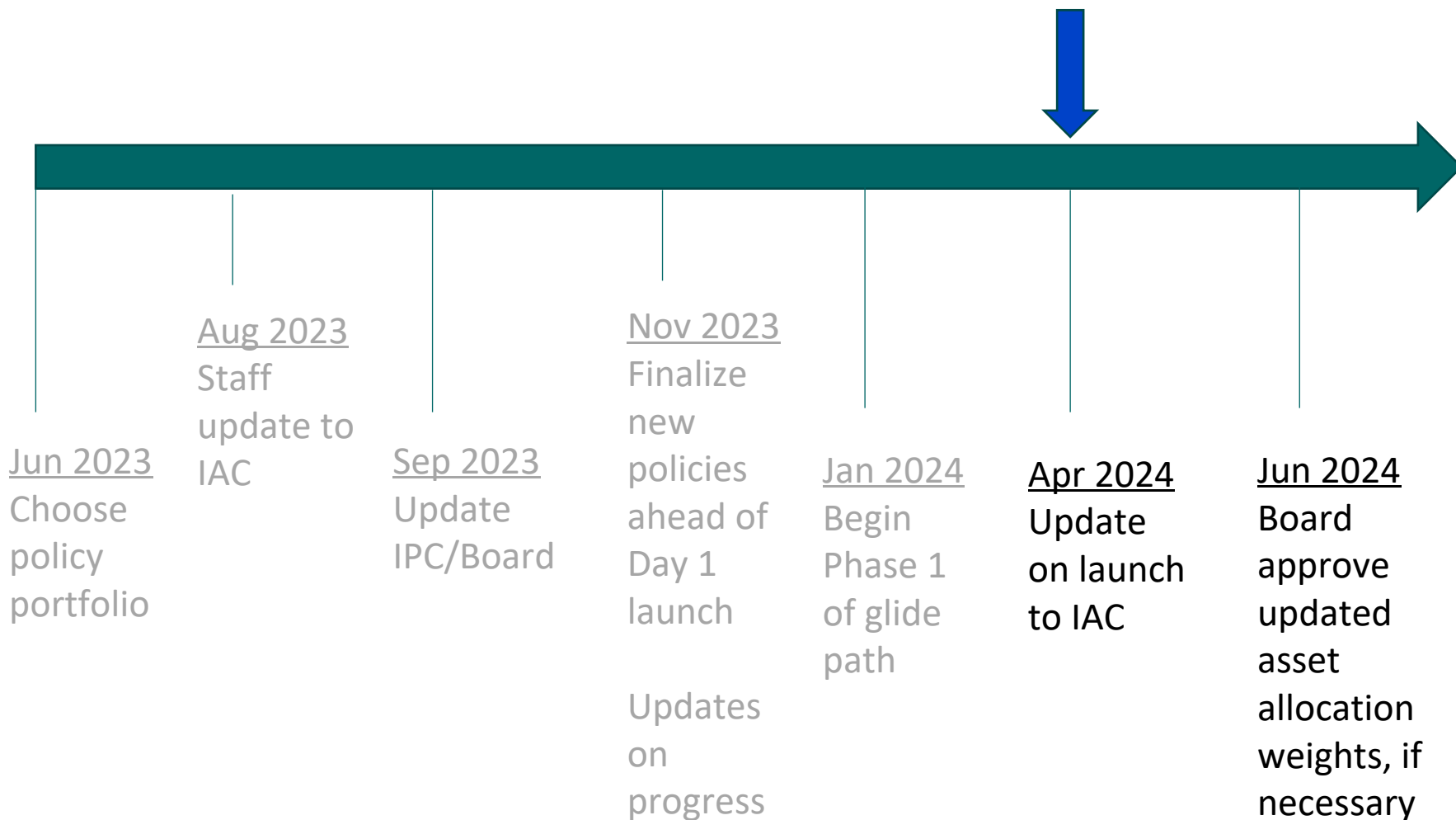
Chung Ma  
Managing Director, Portfolio Solutions Group

April 10, 2024



- Roadmap
- Expected glide path
- Fund positioning
- Implementation progress
- Looking forward

# Roadmap



# Expected Glide Path - Updated

## Policy Weights

	Current	July 2024	CY 2025	CY 2026
Public Equity	33	33	32	32
Fixed Income	16	16	16	16
Credit	14	14	15	16
Real Assets	14	14	14	15
Private Equity	16	16	16	15
MAPS	4	4	5	6
PIP	2	2	2	1
Cash	2	2	2	2
<b>Gross MV*</b>	<b>101</b>	<b>101</b>	<b>102</b>	<b>103</b>
<b>Leverage</b>	<b>-1</b>	<b>-1</b>	<b>-2</b>	<b>-3</b>
<b>Net MV*</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

\* MV-market value

# Fund Positioning

	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>	
Total Fund (Gross Market Value)	112.5	100.6%	101.0%	-0.4%		
Leverage,	-0.7	-0.6%	-1.0%	0.4%	-3%	0%
<b>Total Fund (Net Market Value)</b>	<b>111.8</b>	<b>100.0%</b>	<b>100.0%</b>	<b>0.0%</b>		

Public Equity	38.1	34.1%	33.0%	1.1%	26%	40%
Fixed Income	16.0	14.3%	16.0%	-1.7%	12%	23%
Credit Strategies	15.9	14.2%	14.0%	0.2%	7%	21%
Real Assets	14.1	12.6%	14.0%	-1.4%	7%	21%
Private Equity	19.0	17.0%	16.0%	1.0%	9%	23%
Multi Asset Public Strategies	3.5	3.1%	4.0%	-0.9%	1%	9%
Private Investment Partnership	2.4	2.1%	2.0%	0.1%	0%	4%
Exposure Management Portfolio	1.1	1.0%	0.0%	1.0%	0%	6%
Cash	2.4	2.2%	2.0%	0.2%	0%	7%

<u>High-Level Exposure</u>	<u>Current \$Bil</u>	<u>Current Weight</u>	<u>Policy Weight</u>	<u>Variance</u>	<u>Allowable Range</u>	
Total Equity	57.1	51.1%	49.0%	2.1%	39%	59%
Fixed Income + Cash	18.4	16.5%	18.0%	-1.5%	12%	27%

As of March 29, 2024 (last business day)



- Successfully launched leverage, at ~1%, in January 2024
- Based on cash needs, the VRS portfolio is using less leverage than the policy portfolio
- Implemented enhanced operational processes
- Director of Treasury hired and started

- Keep developing infrastructure for leverage operations
- Maintain active knowledge-sharing with peer asset owners and securities financing community
- Transform leverage financing information into decision-making intelligence
- Add more flexibility for liquidity framework
- Stay abreast of potential regulatory changes

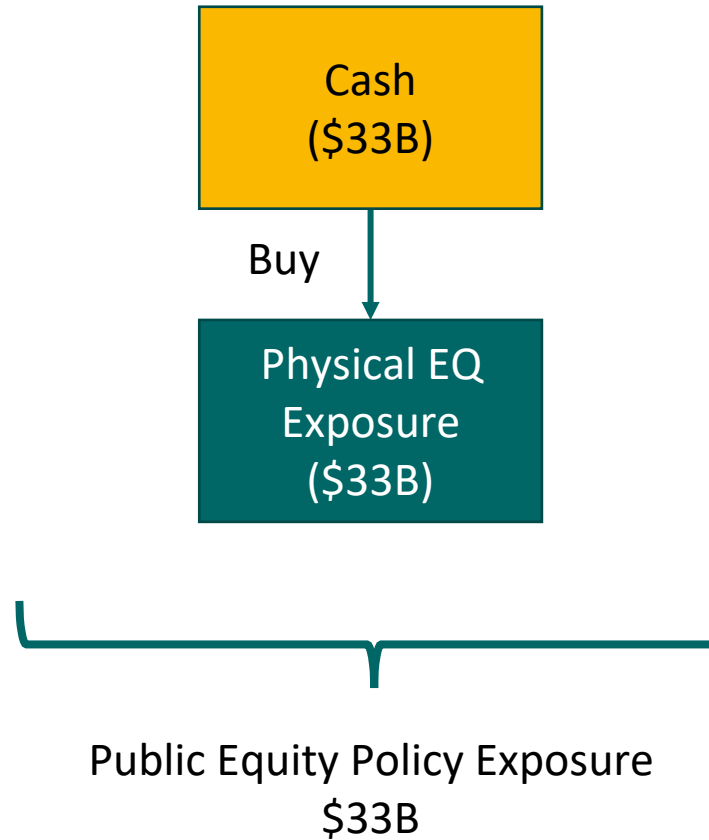
# Appendix

# Use of Synthetics – Pre-Leverage

## Illustrative

33% Policy Allocation to Public Equity (EQ)

Economic Exposure



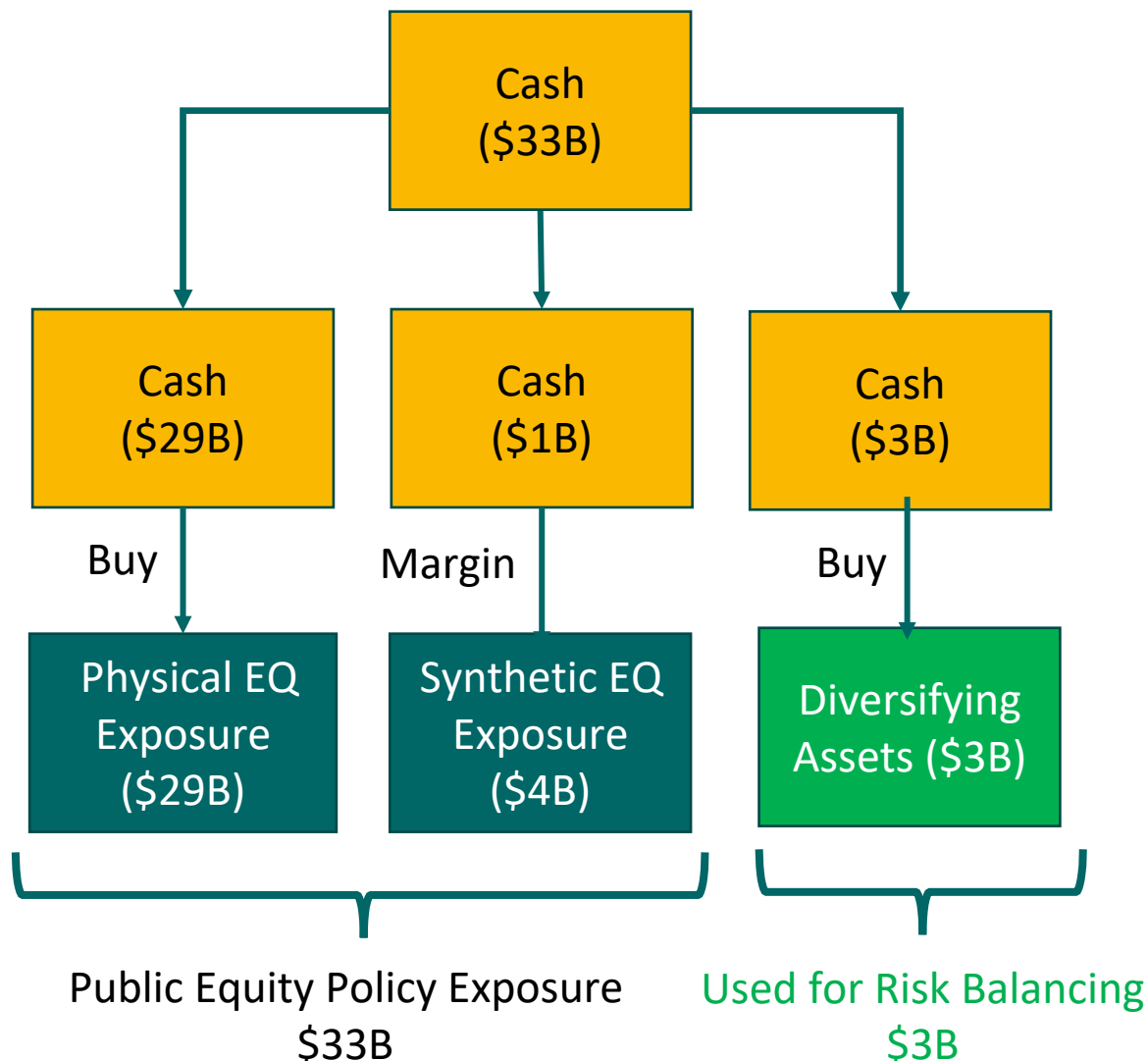
# Use of Synthetics – As Funding Source

## Illustrative

33% Policy Allocation to Public Equity (EQ)

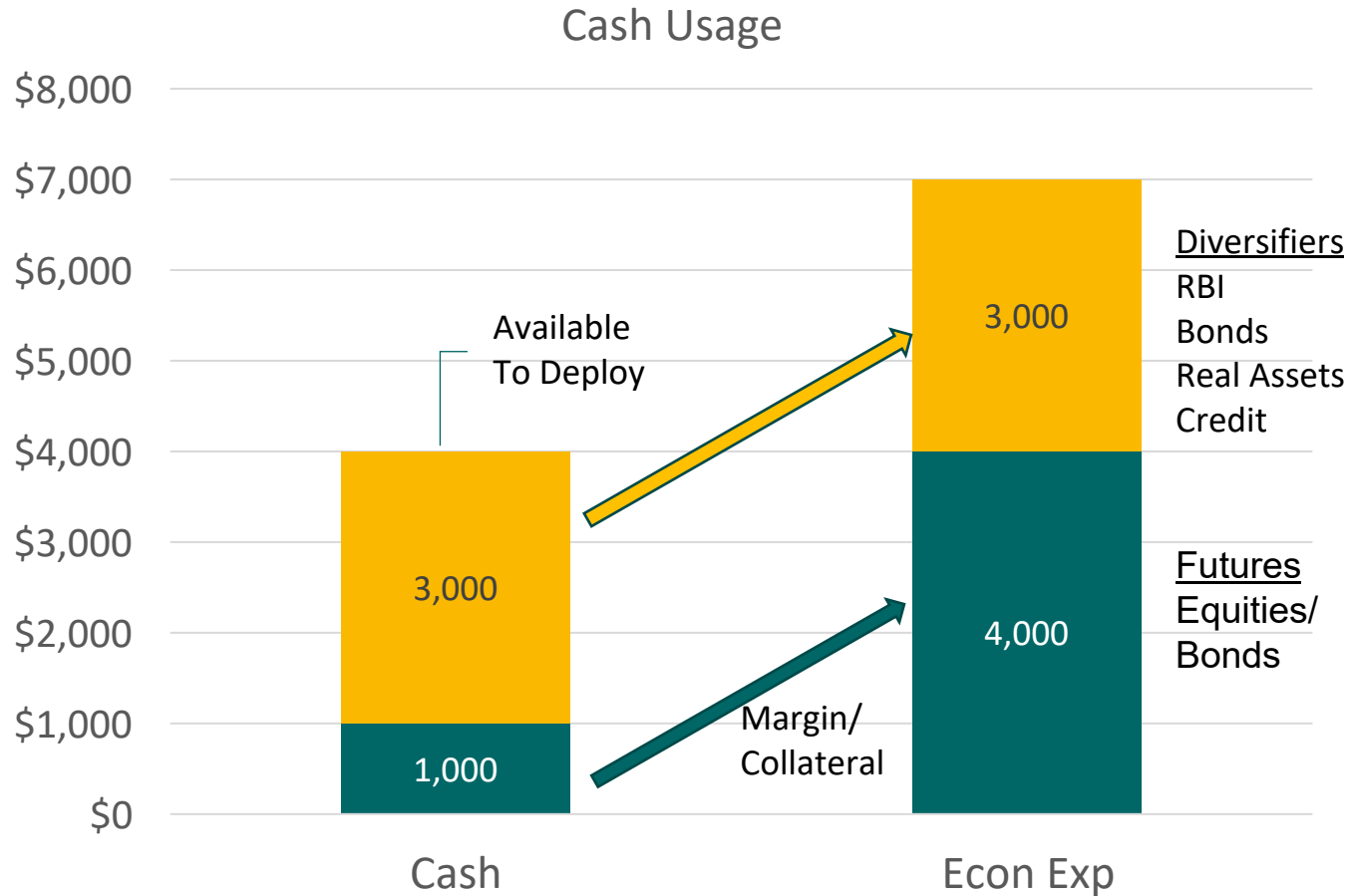
Allocate Cash to Exposures (\$33B)

Economic Exposures\* (\$36B)



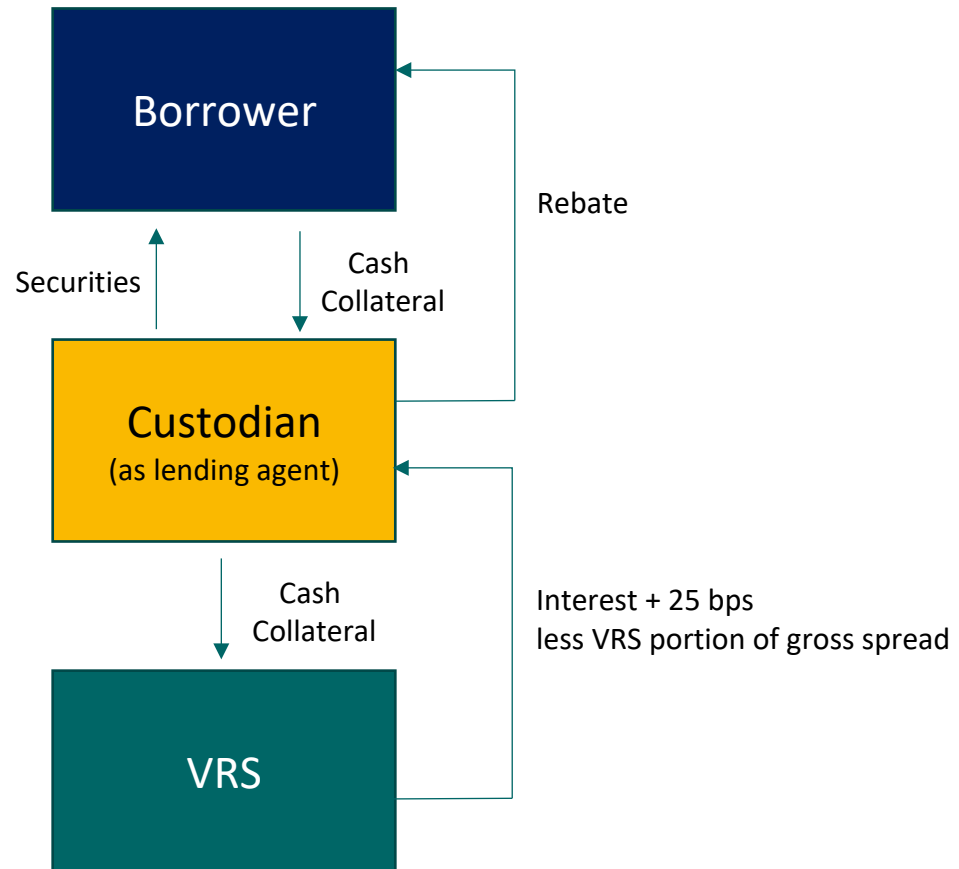
# Cash Management - Synthetic Case Study

Synthetic exposure allows for re-allocation to other assets

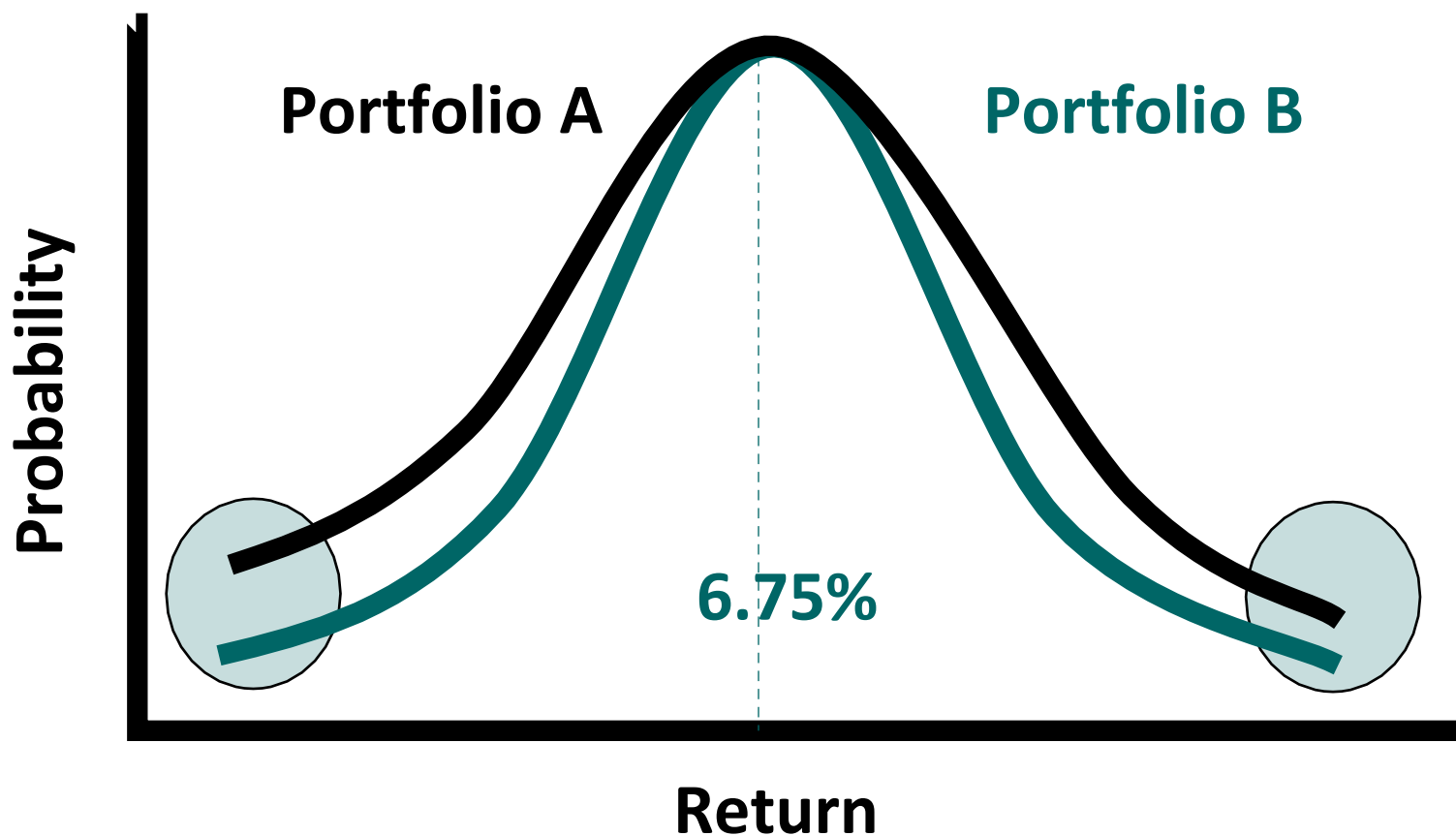


Illustrative, numbers are in US dollars, millions

# Securities Lending Cash Release – As Funding Source



## Illustrative







Virginia  
Retirement  
System

# Investment Advisory Committee

## Public Market Assets

### Program Reviews

April 10, 2024



## Overview

(J.T. Grier, Managing Director)

## Program Reviews

- **Public Equity**

(Dan Whitlock, Program Director)

- **Internal Equity Management Public Equity**

(Dan Schlussler, Program Director)

- **Fixed Income**

(Parham Behrooz & Greg Oliff, Co-Directors)

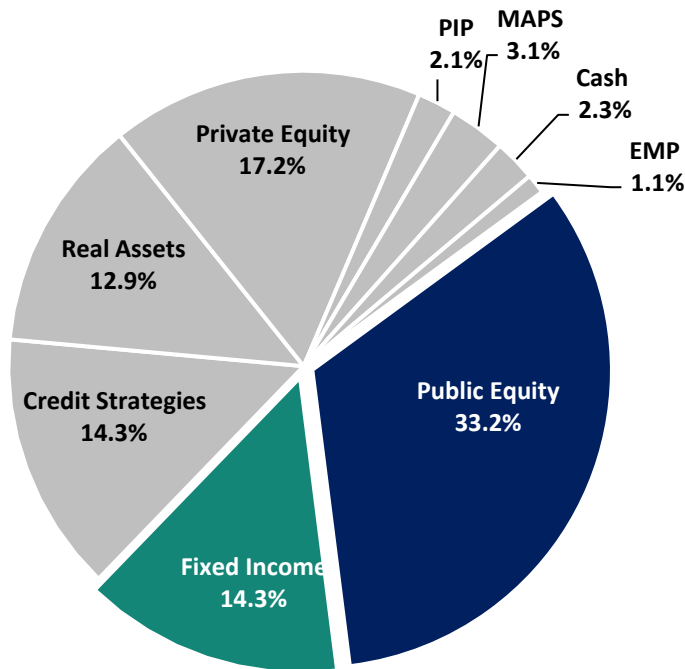
# Public Market Program Overview

J.T. Grier  
Managing Director, Public Markets



# Overview: Public Market Assets

## Public Market Assets: 44.1%



Market values as of 02/29/2024; source: BNY Mellon data

### Public Equity

- 23 Developed Mkts
- 27 Emerging Mkts

### Internal Equity Management

- ≈45% of Public Equity
- Invested in 50 Global Mkts

### Fixed Income

- U.S. Core Focus
- USD EMD
- High Yield

# Overview: Preview Of Agenda Items



# Public Equity

Dan Whitlock and Dan Schlusser  
Program Directors



# Agenda: Public Equity Annual Review Topics

- Overview
- Markets
- Exposures
- Results
- Mandates
- Looking Forward

# Overview: Public Equity Team Members



Professional	Position	Area(s) of Focus	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Dan Whitlock	Program Director	Public Equity	MBA	CFA, CAIA	22	22
Stephen Adelaar	Sr. Portfolio Manager	Hedge Funds, Emerging Markets, Defined Contribution Plan	MS	CFA	24	17
Holly Glass	Portfolio Manager	Small Cap, Risk Management, Transition Management, Internal	MA	CFA	23	23
Korey Turner	Sr. Investment Analyst	Global, Reporting	MS/MBA		4	4
Kelly Baker	Portfolio Assistant		AAS		14	9
Additional Resources	Internal Equity Team, Portfolio Solutions Group, Governance Team, Management Committee, Operations Team, Compliance Team, Legal/Regulatory Team, Investment Decision Support					

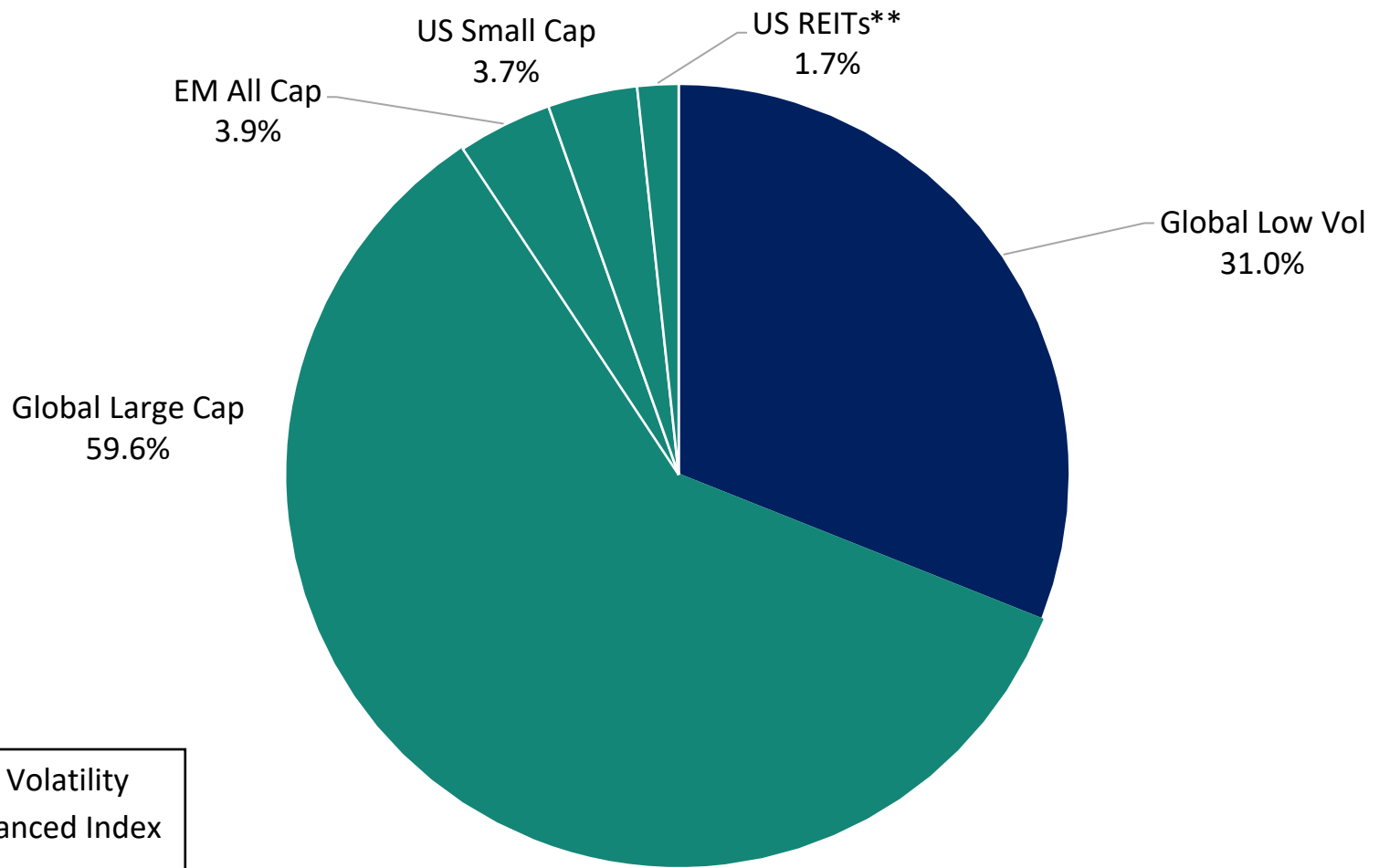


# Overview: Internal Equity Team Members



Professional	Position	Area(s) of Focus	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Dan Schlussler	Program Director	Internal Equity	MBA	CFA	28	11
Ryan Carlson	Portfolio Manager	U.S. REIT & Small Cap, Investment Tools	BS	CFA	21	4
Bill Chen	Sr. Investment Officer	Research	MBA	CFA	6	1
Joe Kennebeck	Sr. Investment Officer	Head Trader	BA		31	17
Aaron Lazar	Sr. Investment Officer	Currency Hedge, U.S. REIT, Swaps & Equity Trading	MA	Passed CFA Level 1	10	10
Vu Le	Sr. Portfolio Manager	Global Enhanced, Research, Currency Hedge	PhD	CFA	13	12
Alex Muniz	Sr. Portfolio Manager	Global Low Volatility, Research	MA	CFA	23	23
Garret Rhodes	Investment Officer	Global Enhanced, Currency Hedge, Research, Swaps Trading	MS	CFA	5	5
Larry Tentor	Sr. Portfolio Manager	Global Low Volatility, Data Infrastructure, Investment Tools	PhD	FRM	22	16
Weldon Wirick	Portfolio Manager	Emerging Markets, Trading	MA	CFA	22	18
Additional Resources	Investment Operations Department Portfolio Solutions Group Investment Decision Support					

# Overview: Internal Equity Asset Allocation

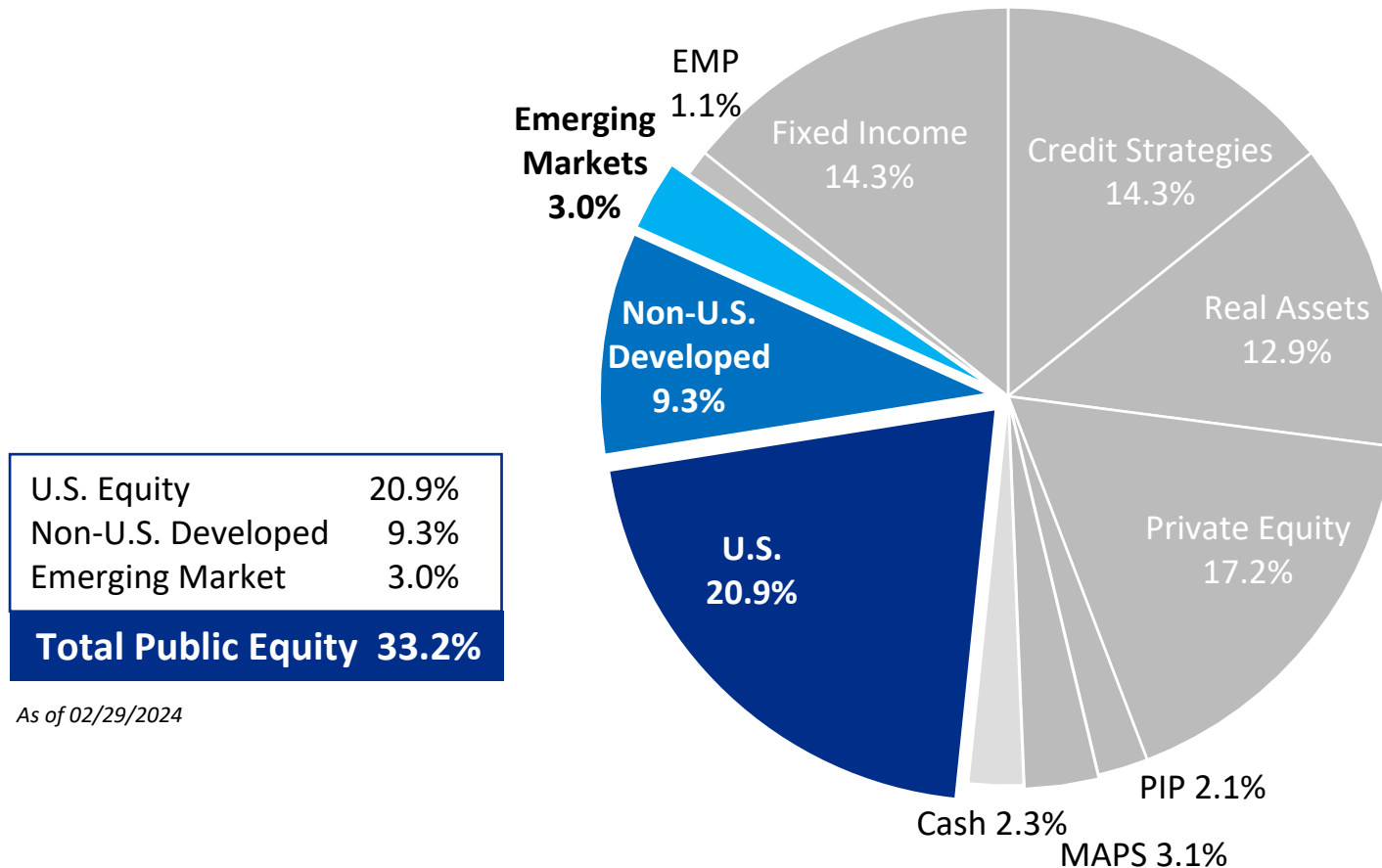


\* As of 2/29/2024

\*\* MSCI USA Portable Alpha Strategy

# Overview: Public Equity Asset Allocation

\*Note: Includes Plan Leverage of 0.6%



As of 02/29/2024

# Overview: Public Equity Philosophy



- **Primary Objective**  
Gain exposure to global economic growth & the global equity risk premium
- **Specific Return Objective**  
Outperform the strategic benchmark over three to five years
- **Approach**  
Both the program and benchmark have a lower absolute volatility than the capitalization weighted broad market to provide less downside risk to the plan
- **Strategic Benchmark (as of 1/1/2024)**  
85% MSCI All-Country World Index Investable Markets Index and 15% MSCI World Minimum Volatility Index

# Exposures: Public Equity Positioning

**\$36.2 Billion (without leverage)**  
**32.7% of Plan Assets (without leverage)**

60% Domestic (-2.9% vs. bmk)  
30% Non-US Developed (+2.4% vs. bmk)  
9% Emerging Markets (+0.5% vs. bmk)

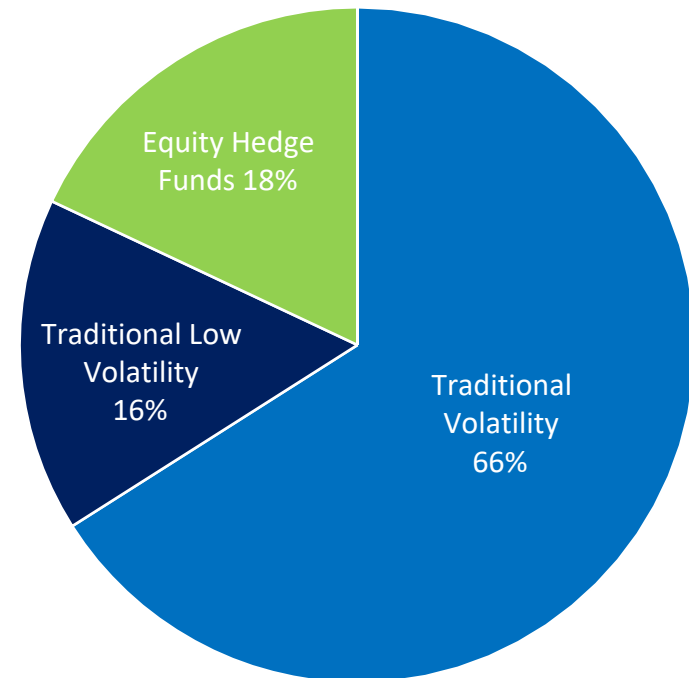
65% Active  
35% Enhanced

51% Internal  
49% External

66% Traditional Volatility  
16% Traditional Low Volatility  
18% Equity Hedge Funds

1.04 Beta  
1.49% Forecasted Active Risk (Barra)

As of 02/29/2024



25 External Mandates (13 Traditional & 12 HFs)  
21 External Managers (9 Traditional & 10 HFs)

# Exposures: Public Equity Portfolio Changes

## A Year of Action

Initiatives included:

- Cash needs for plan
- IEM move to Global
- HF changes
- Benchmark Change

Raised ~\$3.9 billion for plan needs

Rebalanced ~\$14.9 billion within Public Equity

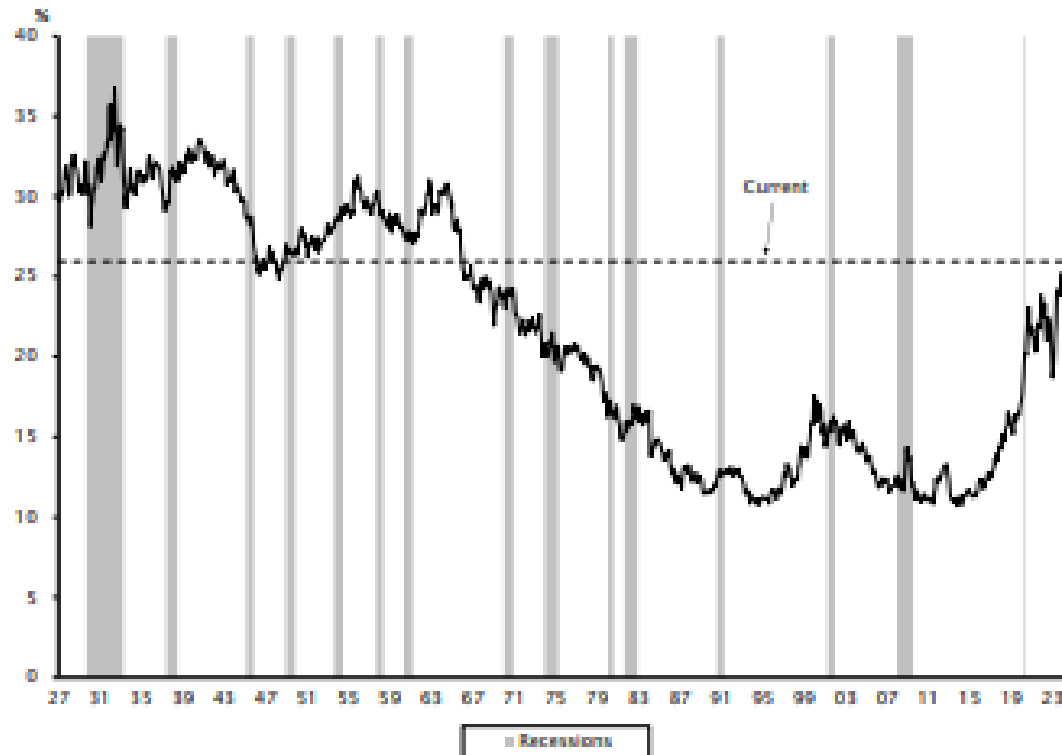
3 Terminations, 3 accounts closed, 2 accounts opened, 1 Hire

As of 02/29/2024

Total PE	Dec-22	Dec-23	Feb-24	Difference
Traditional	65%	68%	66%	1%
Low Volatility	13%	14%	16%	3%
Hedge Funds	22%	18%	18%	-4%
Active	69%	66%	65%	-4%
Enhanced	31%	34%	35%	4%
Internal	45%	44%	51%	6%
External	55%	56%	49%	-6%
AUM (billions)	30	36	36	6
% of Total Fund	30%	33%	33%	2%

# Markets: Increased Concentration

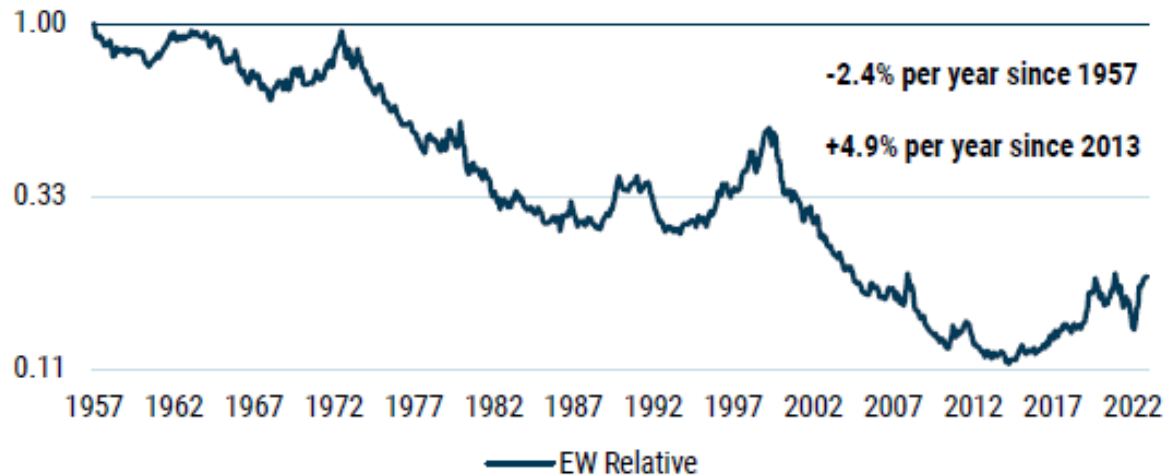
**Exhibit 1: Large-Capitalization Stocks**  
**Share of Capitalization from the Largest Seven Stocks**  
**1927 Through Mid-February 2024**



Source: Empirical Research Partners Analysis.

# Markets: Increased Concentration

EXHIBIT 2: S&P500 – TOP 10 VS. 490 EQUAL WEIGHTED

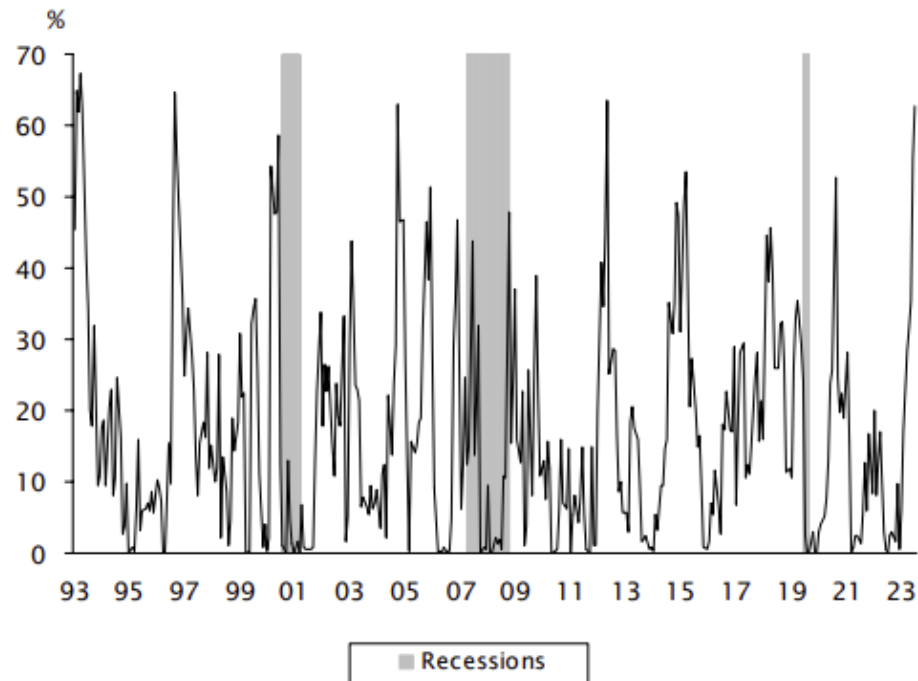


Data from 1957-2023; Source: GMO, Compustat, Standard & Poor's



# Markets: 2024 Starts with Stock Specific Drivers

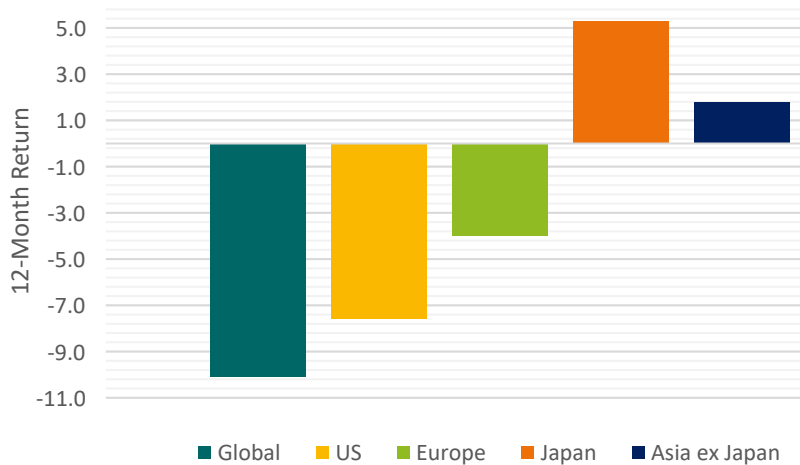
**Exhibit 15: Large-Capitalization Stocks  
Share of the Return Dispersion Explained by  
Dispersion in Earnings Surprise  
Measured Over Nine-Month Windows  
1993 Through Early-March 2024**



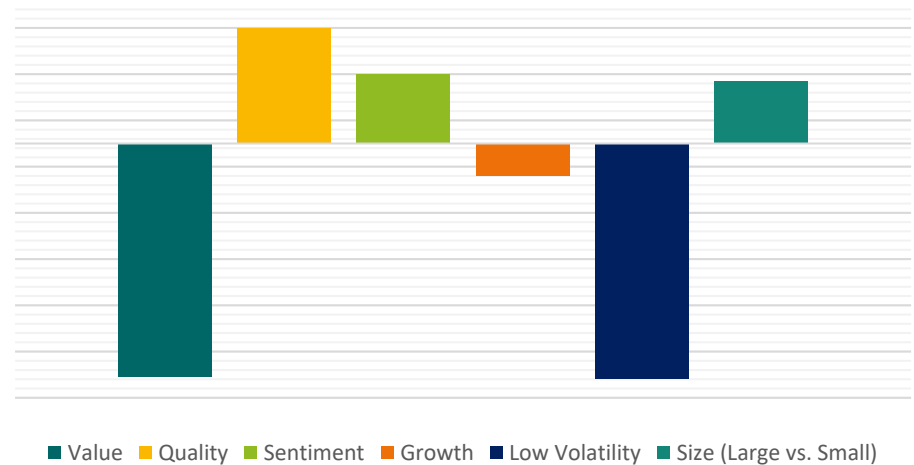
Source: National Bureau of Economic Research, Empirical Research Partners Analysis.

# Markets: Factor Returns

Value Factor Returns by Region



Global Style Factor Returns

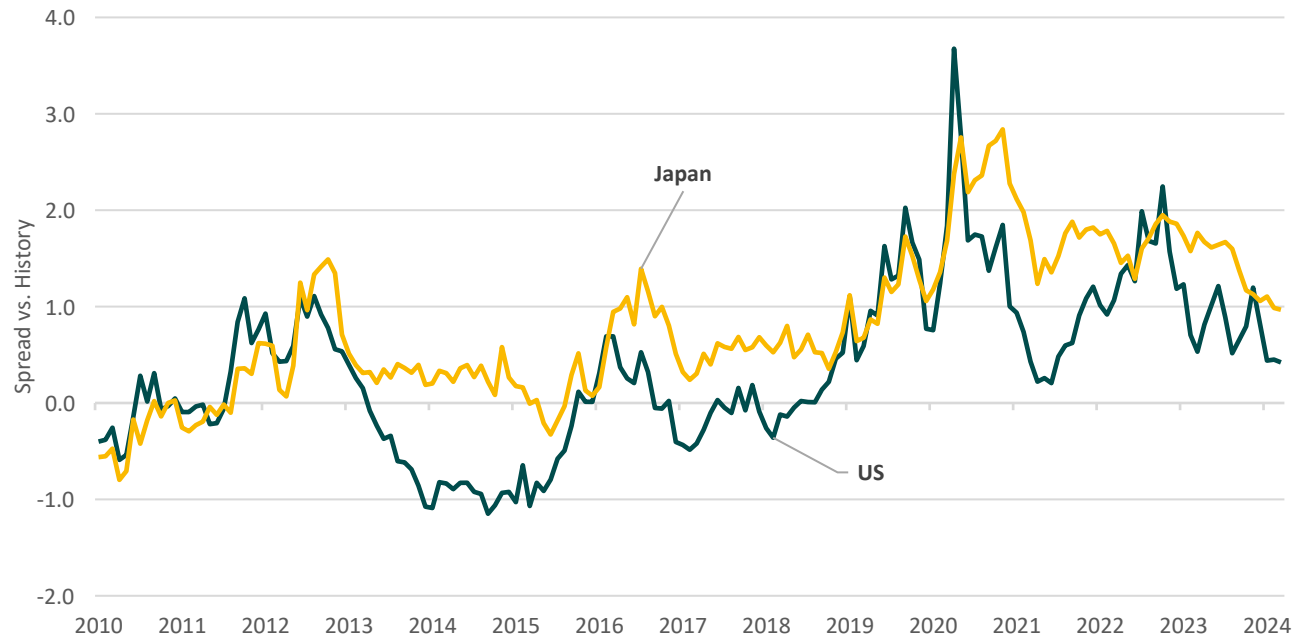


Source: UBS  
 Long Minus Benchmark. Region, size and sector neutral, cap-weighted  
 One-Year Returns Ending February 29, 2024

# Markets: Value Opportunity

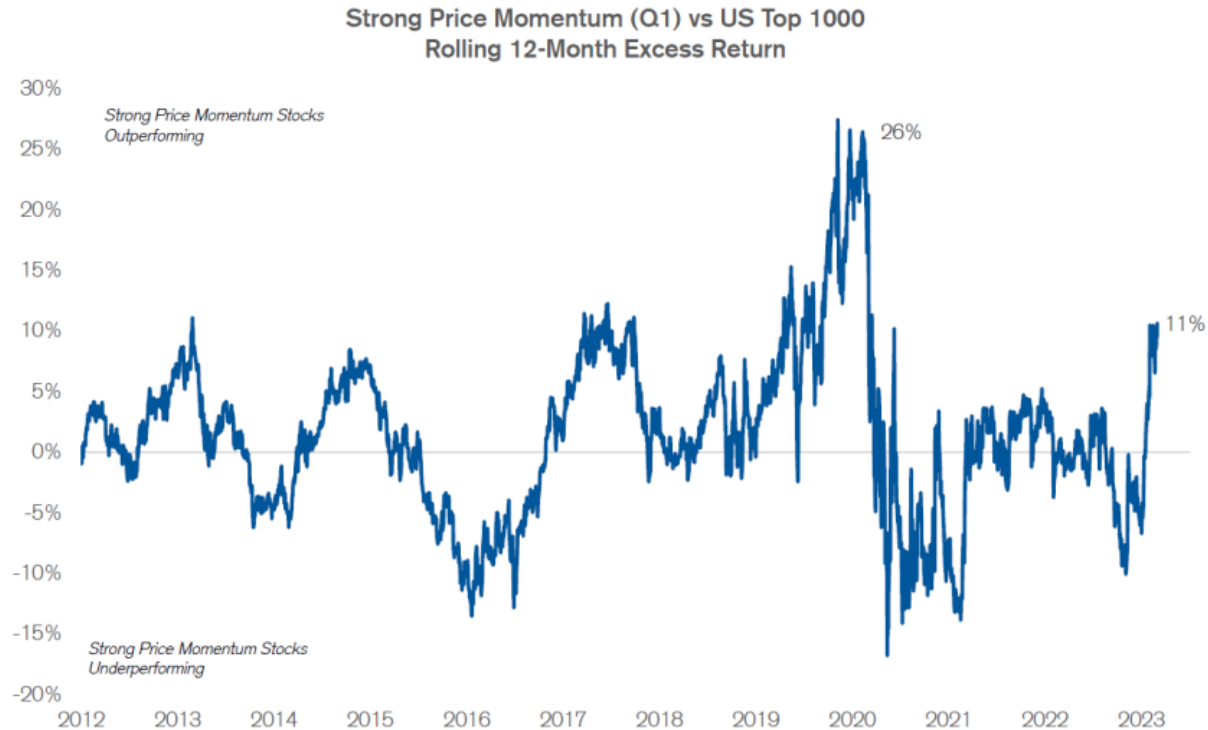
## Value Spreads

US vs. Japan



Source: Refinitiv, Credit Suisse HOLT  
Long minus benchmark. Sector neutral, equal-weighted

# Markets: Factor Returns

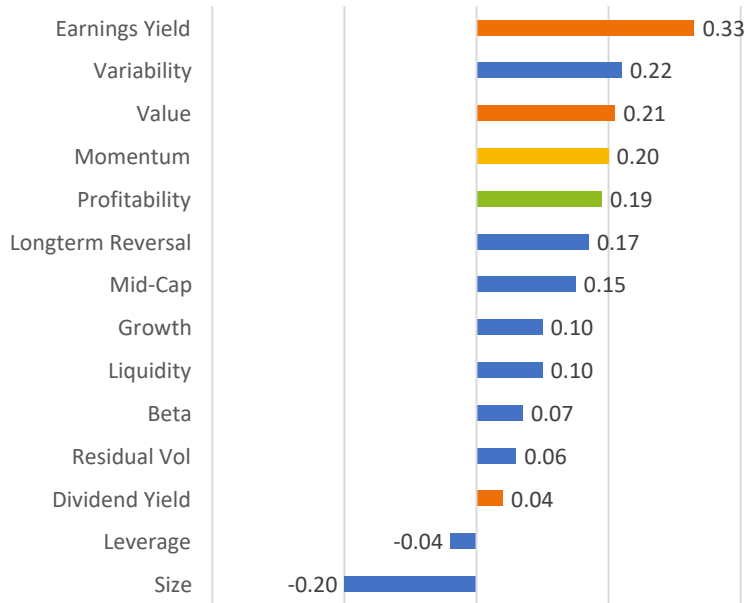


Source: Credit Suisse HOLT, the BLOOMBERG PROFESSIONAL™ service. Data Date: 3/1/2024.

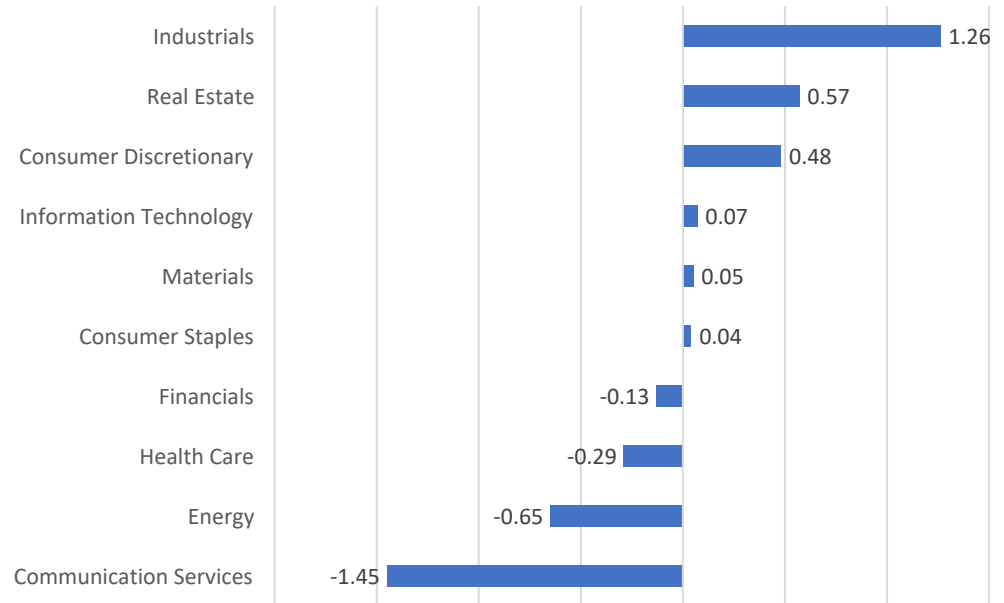
Universe: Top 1000 stocks by market cap. Q1 Price Momentum based on Region, Size relative Factor. Performance of equally weighted, monthly rebalanced groups of stocks.

# Exposures: Internal Equity Style Factor & Sector Allocations

Factor Active Weights



Sector Active Weights (%)



As of 2/29/2024

# Results: Internal Equity Program Performance



	IEM Active				IEM Enhanced Index				IEM Low Volatility			
	10 Yr	5 Yr	3 Yr	1 Yr	10 Yr	5 Yr	3 Yr	1 Yr	10 Yr	5 Yr	3 Yr	1 Yr
<b>Total Active Internal Equity</b>	9.49	10.59	9.64	24.15	9.90	11.61	9.93	26.61	8.47	8.30	8.97	18.64
<b>IEM Benchmark</b>	9.26	10.46	7.71	22.14	9.71	11.16	7.82	23.52	8.17	8.89	7.53	19.07
<i>Excess Returns</i>	0.23	0.14	1.93	2.01	0.19	0.44	2.12	3.09	0.30	-0.58	1.44	-0.43
<i>Realized Tracking Error</i>	1.11	1.33	1.33	1.38	0.98	1.25	1.26	1.42	2.06	2.11	2.26	2.07
<i>Realized Information Ratio</i>	0.20	0.10	1.45	1.46	0.19	0.36	1.68	2.18	0.14	-0.27	0.64	-0.21

As of 2/29/2024

# Results: Internal Equity Strategy Performance



	Inception Date	Mkt Value (\$MM)	1-Year Return	1-Year Excess	Since Inc. Excess	Since Inc. Tracking
<b>Enhanced Index Strategies</b>		<b>12,653</b>	<b>26.61</b>	<b>3.09</b>	<b>0.38</b>	<b>0.87</b>
U.S. Small Cap (Afton)	Jun-05	671	15.67	4.58	0.61	1.91
U.S. REITs** (Amherst)	Dec-05	318	32.11	1.38	0.99	1.13
EM All Cap (Tuckahoe)	Sep-15	718	14.21	3.72	0.03	1.89
Global Dev. Large Cap (Rivanna)	Sep-22	10,946	28.57	3.01	2.78	1.34
<b>Low Volatility Strategies</b>		<b>5,697</b>	<b>18.64</b>	<b>-0.43</b>	<b>1.68</b>	<b>2.69</b>
Global Dev. Large Cap (Bearfence)	Jan-24	5,697	N/A	N/A	0.00	N/A
<b>Other Mandates</b>						
Currency Hedging	Apr-09	2,478	N/A	N/A	N/A	N/A

As of 2/29/2024

\*\*MSCI USA Portable Alpha Strategy

# Results: Public Equity



	10 Year	5 Year	3 Year	1 Year
<b>Total Public Equity</b>	<b>8.49</b>	<b>10.20</b>	<b>7.41</b>	<b>21.99</b>
Strategic Benchmark	8.49	10.35	6.49	21.94
Excess Return	0.00	-0.15	0.92	0.05
Beta vs. Strategic Benchmark*	0.94	0.92	0.89	
Alpha**	0.36	0.37	1.17	
Active Risk vs. Strategic Benchmark***	1.66	2.22	2.50	
Information Ratio vs. Strategic Benchmark****	0.00	-0.07	0.37	

\*Measure of volatility, or systematic risk, of a portfolio in comparison to a benchmark

\*\*Risk-adjusted excess return (accounts for market beta)

\*\*\*A relative risk measure otherwise known as tracking error, this is the standard deviation of returns relative to a benchmark

\*\*\*\*A measure of excess return per unit of relative risk (Portfolio Returns - Benchmark Returns) / Active Risk

As of 02/29/2024



# Results: Public Equity 1 Year Trailing Update

## 1 Year Performance Factor Attribution\*

### Factor Impact Summary:

- Stock selection was positive more broadly.
- Momentum and profitability factors added value.
- Lower Beta profile in first 10 months couldn't keep up with a hot market.
- Managers had headwinds from being underweight the U.S..

Attribution	1 Year Trailing (through Feb)
Portfolio Base Return	23.52%
Benchmark Base Return	22.04%
Excess Return (gross of fees)	1.48%
Currency	-0.02%
Lower Beta	-0.40%
Country Allocation	-0.15%
Selection	2.01%
Industry	0.61%
Style	0.82%
Stock Specific Return	0.58%

\*Attribution is an estimate and does not contain fees, intra-month trading, t-costs, etc.; some categories that are not material were left off.

# Results: External Manager Breakout



	10 Year	5 Year	3 Year	1 Year
<b>External Managers (net of fees)</b>	<b>7.86</b>	<b>9.85</b>	<b>6.04</b>	<b>20.29</b>
Associated Market Cap Benchmarks	7.76	9.55	5.54	20.80
Excess Return	0.10	0.30	0.50	-0.51
Beta vs. Benchmarks*	0.94	0.92	0.86	
Alpha**	0.44	0.79	0.77	
Active Risk vs. Benchmarks***	2.38	3.04	3.44	
Information Ratio vs. Benchmarks****	0.04	0.10	0.15	

As of 02/29/2024

\*Measure of volatility, or systematic risk, of a portfolio in comparison to a benchmark

\*\*Risk-adjusted excess return (accounts for market beta)

\*\*\*A relative risk measure otherwise known as tracking error, this is the standard deviation of returns relative to a benchmark

\*\*\*\*A measure of excess return per unit of relative risk (Portfolio Returns - Benchmark Returns) / Active Risk

VRS Public Equity external managers have had a low excess return correlation (diversification) to internal management over time and have added value net of all fees.

# Managers: Public Equity Hires & Terminations – 1 Year



Action	Effective Date	Commitment/ Current Value	Funding/ Defunding Period	Description
Closed	2/28/2023	\$1 Billion	Immediate	<b>Potomac</b> – Internal U.S. Large cap account
Opened	3/01/2023	\$300 Million	Immediate	<b>Amherst</b> - An internally managed REIT strategy with swap overlay
Terminated	8/17/2023	\$195 Million	Immediate	<b>*Advent Global Convertibles</b> – An account investing in global convertible securities
Hired	12/01/2023	\$500 Million	Immediate	<b>WCM Global Growth</b> - A long-only equity strategy
Terminated	12/29/2023	\$144 Million	Immediate	<b>Taiyo Fund, LP</b> - A Japanese equity activist fund.
Opened	1/02/2024	\$5.5 Billion	Immediate	<b>Bearfence</b> - An internally managed global low volatility equity strategy
Closed	1/02/2024	\$1.6 Billion	Immediate	<b>Piedmont</b> - An internally managed developed non-U.S. low volatility strategy
Closed	1/02/2024	\$3.4 Billion	Immediate	<b>Mobjack</b> - An internally managed low volatility equity strategy
Terminated	1/31/2024	\$224 Million	Immediate	<b>Arisaig</b> – An Emerging Market consumer-oriented strategy.

\*The manager is considered DIME under the Commonwealth of Virginia definition, which defines ownership threshold of 51% or more

# Managers: Diverse Investment Management Engagement (DIME)

## Women & Minority Owned Management Firms Currently In The Lineup

- Ariel managing VRS assets since 2014  
*African-American, Asian-American & women-owned global equity manager*

## Continue To Meet With New Prospects & Consider New Investments

- 89 meetings with minority managers or consultants in last 5 years
- 247 meetings since we started tracking this in late 2009

# Looking Forward: Remain Opportunistic



- Remain a Liquidity Source for the Plan
- Continue To Work Closely With All Cross Functional Teams
- External
  - Opportunistic Manager and Selection, Portfolio Management, and Risk Management
  - Continue Women & Minority Manager Outreach
- Internal
  - After Completing Globalization Effort Now Move to a Greater Focus on Strategy Enhancement
  - Begin Implementation of Technological Improvements to our Investment Platform

# Appendix Public Equity

# Overview: Public Equity Team & Process

	<u>Stephen Adelaar</u>	<u>Holly Glass</u>	<u>Korey Turner</u>	<u>Daniel Whitlock</u>
<b>Strategy Lead</b>	Defined Contribution Emerging Markets Hedge Funds	<i>IEM Group (Italics)</i> Risk Management Small Cap Transition Management	Global Equity Reporting	Total Public Equity
<b>Analyst</b>	Afton ( <i>IEM</i> ) Baillie Gifford EM Baillie Gifford Global Farallon Farallon Healthcare LSV Global LSV Non-U.S. Small Cap LSV U.S. SC Select - Cooper Square Select - SEG WCM	Acadian EM Acadian Small Cap <i>Amherst (IEM)</i> Arrowstreet Global CET Energy Dynamics Cevian Jackson Square Lansdowne Global <i>Rivanna</i> Theleme	Ariel Global Coatue Eminence 150/50 <i>Internal EM (IEM)</i> J.P. Morgan LS Maverick 130/30 ValueAct Capital	<i>BearFence</i> Nitorum

# Overview: Public Equity Manager Evaluation Framework



## Sustainable Risk-Adjusted Returns

- Long history, repeatable process, consistent philosophy
- Sustainable team and firm
- Outperformed in a consistently diversified manner
- Outperformed when considering risk profile
- Track record not driven by any particular outsized allocations

## Doing Things Differently

- Low correlations to existing book (quantitative & qualitative)
- Something VRS cannot produce internally
- Something one of VRS' existing external managers cannot provide
- Employ a different way of thinking or different strategies

## Terms & Back Office

- Favorable fees, liquidity, etc.
- Robust back office
- Partnership mentality
- Resources to manage sizeable allocations



# Due Diligence: Constant Re-Underwriting

## Existing Portfolio

- **Qualitative:** long-term relationships, frequent communication, monitor organizations & personnel
- **Quantitative:** monitor exposures & performance & risk, risk budget drives allocation, identify new strategic & tactical tilts

## Assess Opportunity

- **Qualitative:** identify attractive investments, identify talented managers, utilize network of contacts
- **Quantitative:** multiple data sources/screen universe, identify potential manager, evaluate performance & risk of prospects

## Manager Due Diligence

- **Qualitative:** face to face manager meetings, review firm strategy & process, detailed portfolio reviews, reference checks
- **Quantitative:** due diligence of existing managers, attribution, verify performance, assess risk

## Portfolio Construction & Risk Management

- **Qualitative:** bottom-up portfolio construction, look for organizational “cracks” & process changes
- **Quantitative:** review targeted policy allocation & portfolio tilts, determine benchmark & manager allocations, perform risk analysis, monitor exposures



# Markets: 1 Year

	Global	Developed	Dev ex US	US	EMEA	Pacific	Emerging	EM ASIA	EM LatAm	EM EMEA
All Sectors	23.2%	25.0%	14.0%	30.1%	12.7%	17.8%	8.7%	6.9%	22.4%	11.4%
Information Technology	50.4%	53.8%	41.7%	55.5%	40.2%	27.3%	22.9%	22.6%	19.6%	130.4%
Communication Services	37.4%	46.5%	9.8%	55.8%	4.8%	-1.2%	-8.7%	-9.0%	1.5%	-8.9%
Consumer Discretionary	23.5%	27.6%	19.1%	31.8%	12.4%	9.4%	-1.4%	-1.8%	21.0%	0.3%
Industrials	22.6%	23.9%	23.4%	24.0%	23.7%	17.0%	6.4%	7.0%	4.4%	5.2%
Financials	14.8%	14.6%	11.4%	16.3%	11.6%	11.3%	14.9%	9.6%	36.9%	20.1%
Health Care	13.8%	14.3%	12.5%	15.1%	14.8%	-1.5%	0.3%	-1.8%	-7.5%	37.8%
Energy	8.4%	5.0%	5.1%	5.0%	1.4%	12.7%	39.5%	34.3%	84.8%	12.7%
Consumer Staples	4.2%	4.7%	-0.4%	7.9%	-1.3%	-9.2%	-0.2%	-7.7%	14.4%	26.6%
Materials	4.0%	6.6%	5.1%	8.6%	5.9%	0.6%	-7.0%	-8.8%	1.8%	-8.8%
Utilities	2.6%	0.4%	3.4%	-1.4%	1.8%	3.8%	23.1%	22.4%	34.2%	12.5%
Real Estate	2.3%	3.4%	2.2%	4.0%	4.7%	-6.6%	-10.7%	-23.1%	31.6%	28.0%

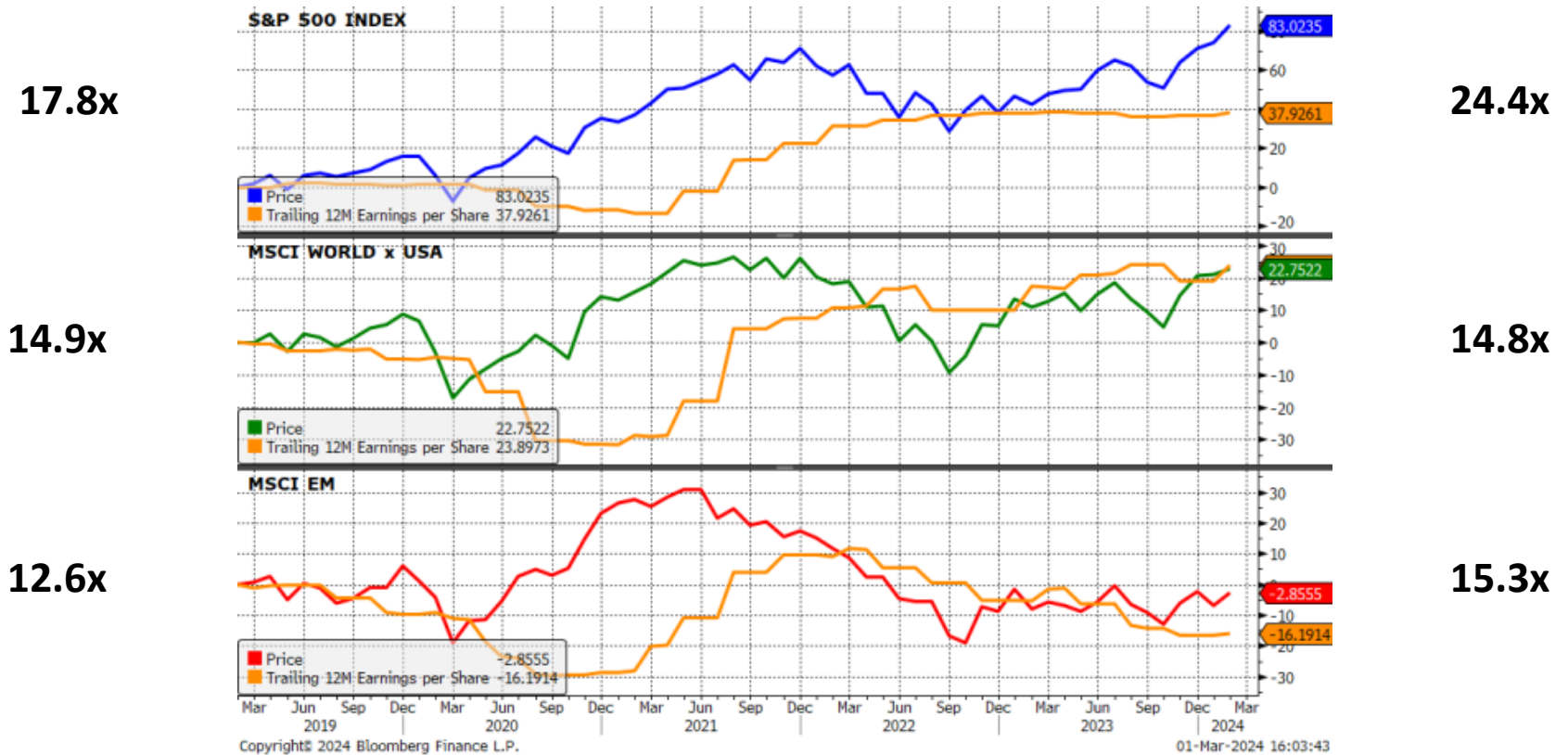
Unhedged Total Returns

Sources: MSCI and Bloomberg

As of 02/29/2024

# Markets: 5 Years

## Percentage Appreciation of Price and Earnings



Source: Bloomberg

As of 02/29/2024

# Exposures: Public Equity Portfolio Characteristics

Portfolio Characteristics	Program	Benchmark
Dividend Yield	2.6%	2.4%
Price to Book	1.5	1.6
Price to Earnings (F12)	14.3	16.5
Price to Earnings (T12)	16.3	20.0
Return on Equity	13.2%	11.5%
Debt to Assets	21.1%	22.1%
Sales Growth	2.6%	3.2%
Net Income Growth	-3.2%	-3.0%
Cash Flow Growth	-2.5%	-2.4%
Profit Margin	8.5%	8.5%

**Benchmark-like Growth with More Attractive Value and Quality Metrics**

# Results: Public Equity Regional Breakout



	10 Year	5 Year	3 Year	1 Year	MV (\$M)
<b>Total Public Equity</b>	<b>8.49</b>	<b>10.20</b>	<b>7.41</b>	<b>21.99</b>	<b>36,238</b>
Strategic Benchmark <sup>1</sup>	8.49	10.35	6.49	21.94	
Excess Return	0.00	-0.15	0.92	0.05	
<b>U.S. Program</b>	<b>10.92</b>	<b>12.20</b>	<b>8.71</b>	<b>21.72</b>	<b>2,481</b>
U.S. Benchmark <sup>2</sup>	11.54	13.15	8.54	23.26	
Excess Return	-0.62	-0.95	0.18	-1.54	
<b>Non-U.S. Developed Program</b>	<b>5.95</b>	<b>6.24</b>	<b>5.41</b>	<b>13.32</b>	<b>1,006</b>
Non-U.S. Developed Benchmark <sup>3</sup>	6.05	7.31	4.20	13.37	
Excess Return	-0.10	-1.07	1.21	-0.05	
<b>Emerging Market Program</b>	<b>4.08</b>	<b>3.49</b>	<b>-1.40</b>	<b>15.60</b>	<b>1,953</b>
Emerging Market Benchmark <sup>4</sup>	3.36	2.77	-4.93	10.49	
Excess Return	0.72	0.72	3.53	5.11	
<b>Global Program</b>	<b>10.18</b>	<b>12.11</b>	<b>9.88</b>	<b>25.68</b>	<b>24,379</b>
Global Benchmark <sup>5</sup>	9.35	11.08	7.23	23.68	
Excess Return	0.83	1.03	2.64	2.00	
<b>Equity Hedge Fund Program</b>	<b>5.60</b>	<b>8.58</b>	<b>4.13</b>	<b>16.63</b>	<b>6,421</b>
Equity Hedge Fund Program Benchmark <sup>6</sup>	6.02	9.19	6.55	22.14	
Excess Return	-0.43	-0.61	-2.42	-5.51	

Please see endnotes for detail on benchmarks

As of 02/29/2024

IAC Meeting – April 10, 2024

# Results: Public Equity

	1 Year
<b>Total Public Equity</b>	<b>21.99</b>
Strategic Benchmark <sup>1</sup>	21.94
Excess Return	0.05

## Large One Year Absolute Return Contributors:

**Positive:** Global program was up 25.7% with a 67% weight

**Negative:** EM was up 15.6% with a 5% weight

## Large One Year Relative Return Contributors:

**Positive:** Global and Emerging Market Managers

**Negative:** Low Vol Mandates, HF Managers

Please see endnotes

As of 02/29/2024

# Managers: Public Equity Top 5



Name	Mandates	# of Mandates	% of Program
VRS Internal Equity	Global, U.S., Emerging	5	51%
Arrowstreet	Global	1	9%
LSV	Global, Non-U.S. Small, U.S. Small	3	7%
Baillie Gifford	Global, Emerging	2	5%
Acadian	Non-U.S. Small, Emerging	2	4%
<b>Total</b>			<b>75%</b>

<sup>1</sup>Effective January 2024, this is the weighted average of the MSCI ACWI IMI (net VRS taxes) 85% and the MSCI World Min Vol (net of VRS taxes) 15% indices

<sup>2</sup>Effective March 2017, this is a weighted average of MSCI U.S. Standard and MSCI U.S. Small Cap indices

<sup>3</sup>Effective February 2020, this is a weighted average of MSCI World ex U.S. Standard (net VRS taxes) and MSCI World ex U.S. Small Cap (net of VRS taxes) indices

<sup>4</sup>Effective April 2009, this is the MSCI Emerging IMI (net of VRS taxes) index

<sup>5</sup>Effective January 2024, this is the weighted average MSCI ACWI Standard (net of VRS taxes) index, the MSCI World Standard (net of VRS taxes) index, and the MSCI World (net of VRS taxes) 40% and the MSCI World Min Vol (net of VRS taxes) 60% indices

<sup>6</sup>Effective February 2020, this is the MSCI ACWI IMI (net of VRS taxes) index



# Appendix Internal Equity

# Overview: Internal Equity Philosophy

Provide Cost Effective Access To The Equity Risk Premium



Provide Risk-Controlled Value Added



Provide Insights Into The Capital Markets



Complement The Total Public Equity Program

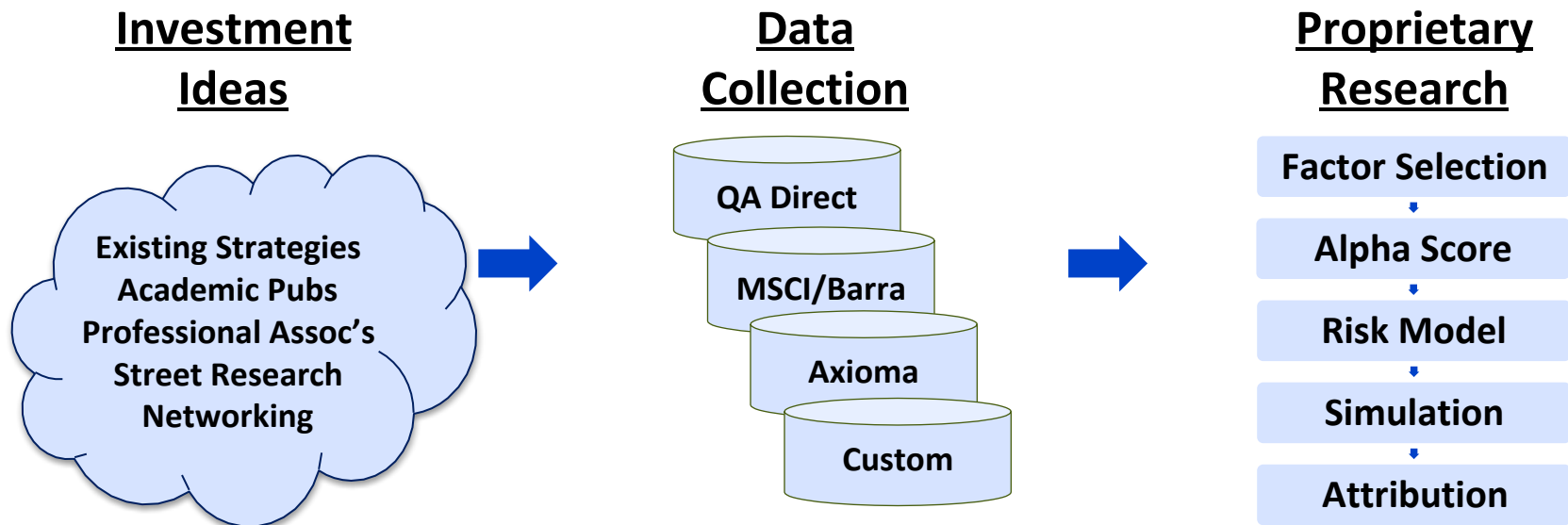
# Overview: Internal Equity Philosophy

## Philosophy – Risk Controlled Relative Value

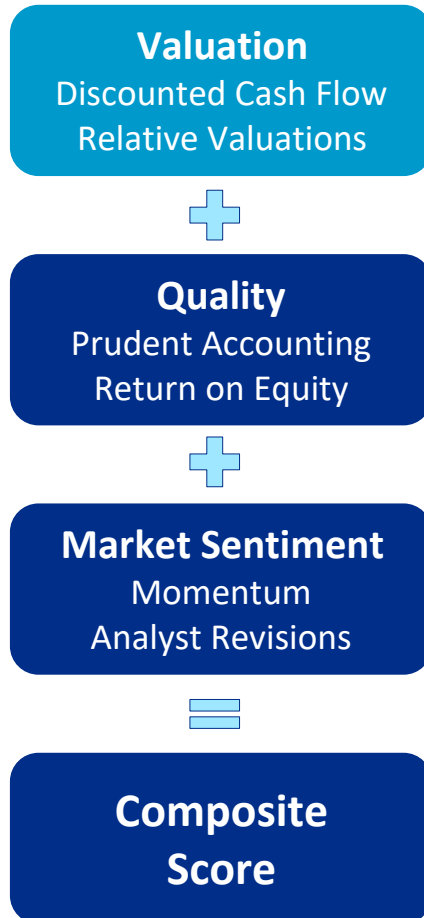
- Markets are relatively efficient
- Behavioral biases create exploitable opportunities
- Systematic strategies are effective at capitalizing on these opportunities



# Overview: Internal Equity Research Process



# Overview: Internal Equity Factor Selection & Alpha Score



- DCF models provide robust estimates of intrinsic value
- RV models compare stocks within cohorts using accounting metrics
- Valuation models identify stocks trading at a discount or premium

- Cash based earnings are preferred to accrual-based earnings
- High & stable profitability help to avoid value traps
- Quality captures accounting strength & management efficiency

- Stock price movements show persistence in the intermediate term
- Analyst revisions have a predictable impact on stock prices
- Market sentiment indicates potential investment opportunities

**Composite score identifies stocks that are trading at a discount, have superior management & positive market recognition**

# Overview: Internal Equity Portfolio & Risk Management

## Quantitative

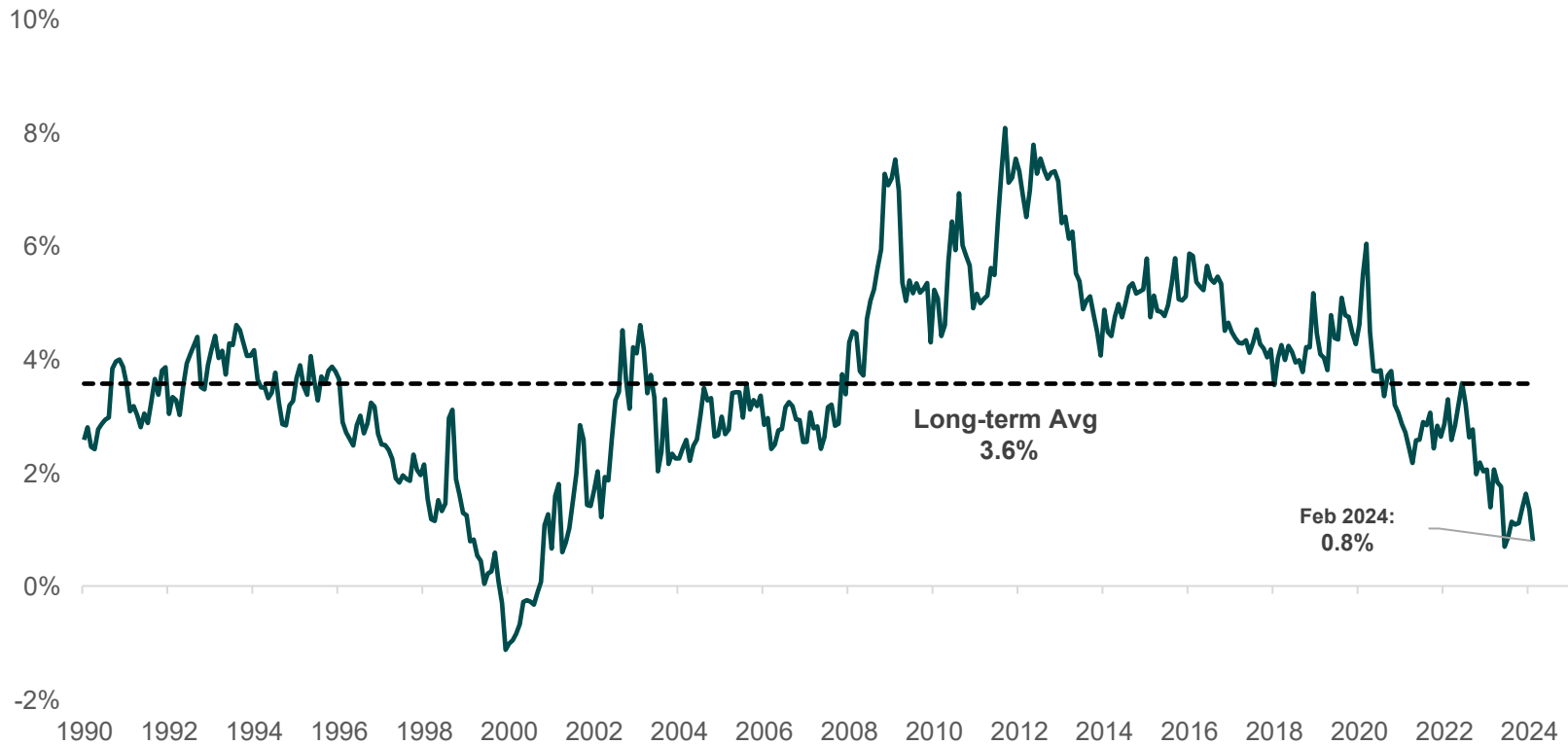
Statistical Risk	<ul style="list-style-type: none"><li>• Fundamental Multifactor Risk Models</li><li>• PCA Risk Models</li></ul>
Factor Constraints	<ul style="list-style-type: none"><li>• Relative or Total Risk</li><li>• Return &amp; Risk Factors</li><li>• Industries, Sectors, Countries, Regions, etc.</li></ul>

## Qualitative

Fundamental & Non-Modeled Risks	<ul style="list-style-type: none"><li>• Forensic Accounting, Shorting Activity, etc.</li><li>• Individual Stock Modeling Tools</li></ul>
Expert Assessment	<ul style="list-style-type: none"><li>• Continuous Monitoring</li><li>• Thematic Trend Analysis</li><li>• Proprietary Research</li></ul>

# Markets: Internal Equity Equity Risk Premium

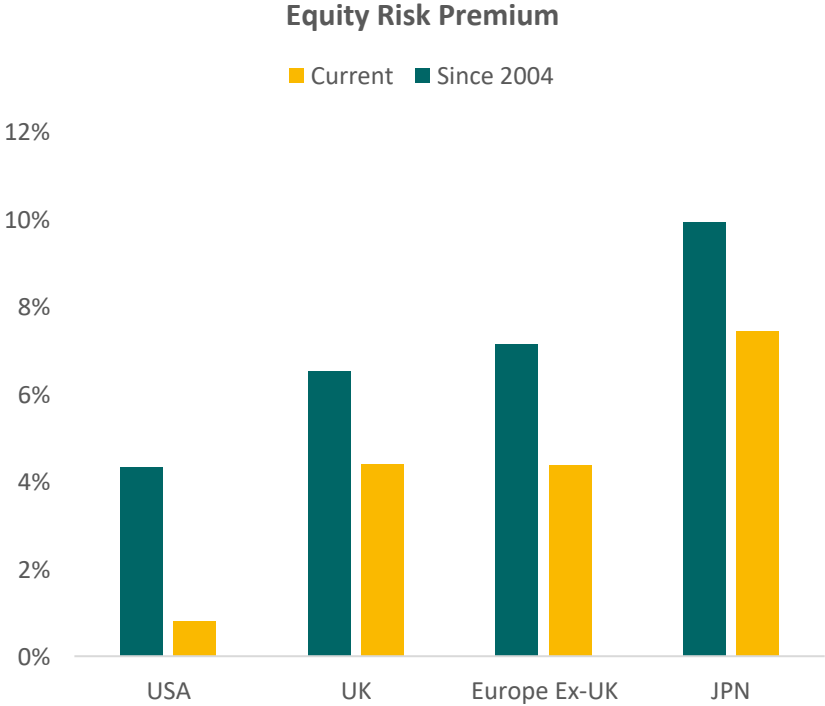
## US Equity Risk Premium



Source: Credit Suisse HOLT

# Markets: Internal Equity

## Developed Markets Equity Risk Premium



Source: Credit Suisse HOLT



# Exposures: Internal Equity Risk & Positions



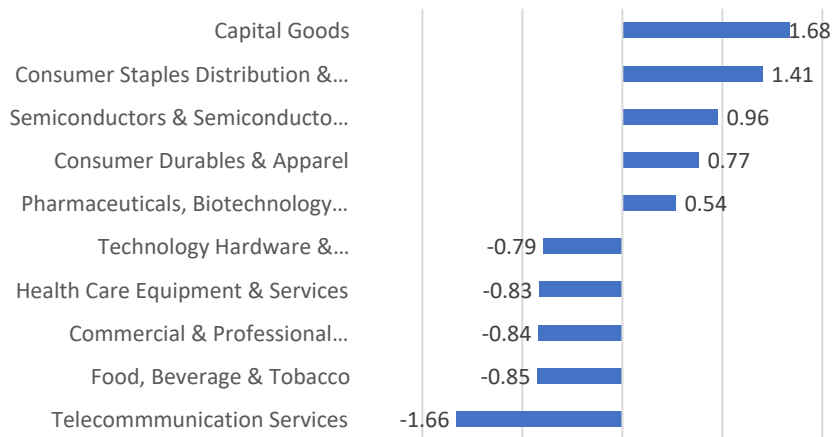
Risk Summary*	Strategy	Mkt Val (\$MM)	Weight	Tracking	% from CF Risk	% from Specific	Risk Attrib	% of TE
<b>Program</b>	<b>Composite</b>	<b>18,351</b>	<b>100.0</b>	<b>1.07</b>	<b>51</b>	<b>49</b>	<b>1.07</b>	<b>100.0</b>
Afton	US Small Cap	671	3.7	1.20	46	54	0.01	1.0
Amherst	US REIT**	318	1.7	1.09	8	92	0.00	0.0
Bearfence	Global Low Vol	5,697	31.0	1.80	44	56	0.47	43.9
Rivanna	Global Dev. Standard	10,946	59.7	1.09	49	51	0.51	54.2
Tuckahoe	Emerging Markets All-Cap	718	3.9	0.86	38	62	0.01	1.0

As of 2/29/2024

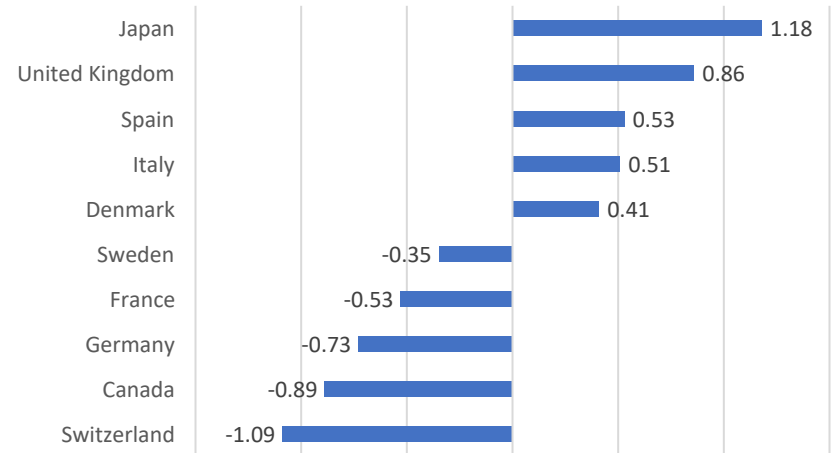
\*\*MSCI USA Portable Alpha Strategy

# Exposures: Internal Equity Industry & Country Allocations

Top 10 Industry Group Active Weights (%)



Top 10 Country Active Weights (%)



As of 2/29/2024



Virginia  
Retirement  
System

# Fixed Income

Parham Behrooz & Greg Oliff  
Co-Directors



# Agenda: Fixed Income Annual Review Topics

- Overview
- Markets
- Exposures
- Results
- Looking Forward
- Collaboration

# Overview: Team Members

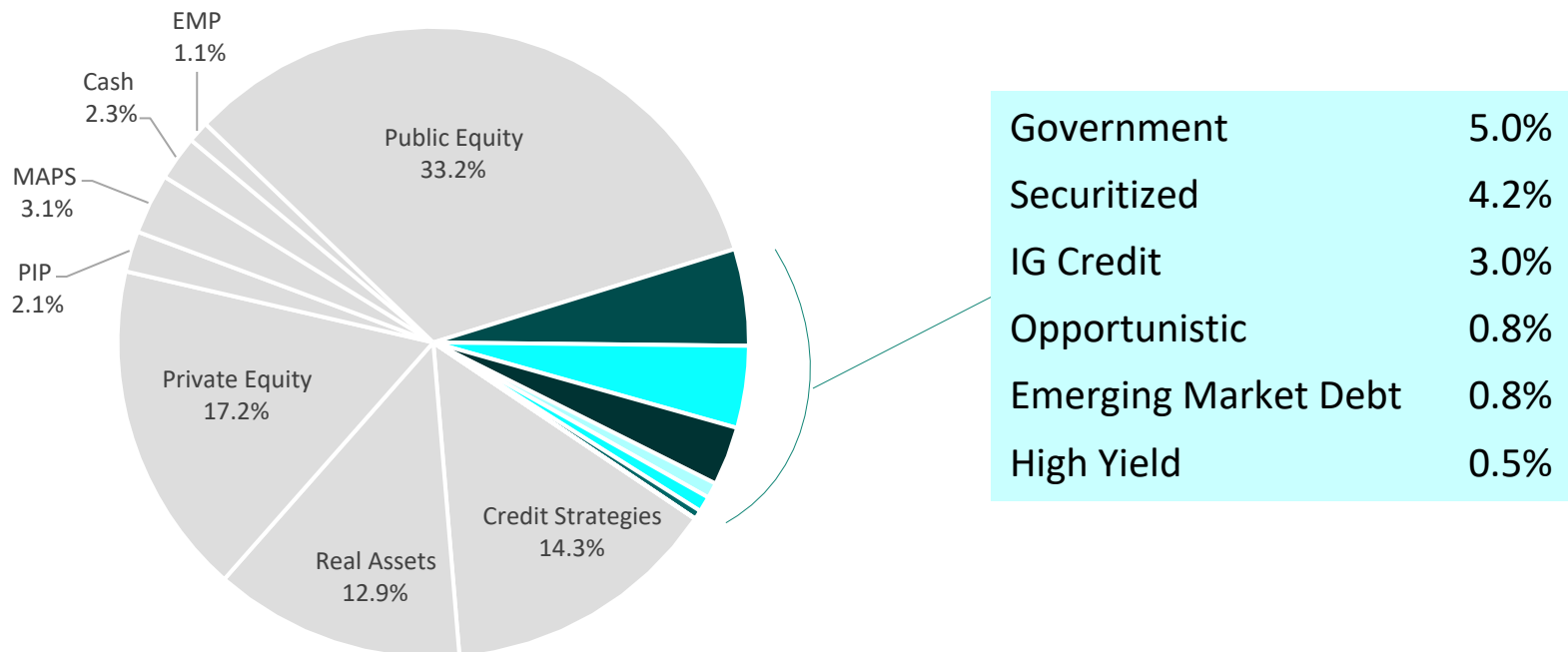


Professional	Position	Highest Degree	Professional Certifications	Investment Experience	VRS Tenure
Parham Behrooz	Co-Director	BS	CFA	27	11
Greg Oliff	Co-Director	MBA	CFA	16	13
Mehtab Haleem	Senior Portfolio Manager	MS		15	3
Teresa Nguyen	Portfolio Manager	MS	CFA	22	7
Michael Desai	Investment Officer	MS	**	7	3
Moeen Mostafavi	Investment Officer	Ph. D	**	1	1
Kidus Molla	Investment Analyst	BS	**	2	2
Additional Resources	Investment Operations Department, Portfolio Solutions Group, Management Committee, Operations Team, Compliance Team, and Legal/Regulatory Team.				

\*\* CFA Candidate

# Overview: Asset Allocation

**Total Fixed Income = 14.3%**

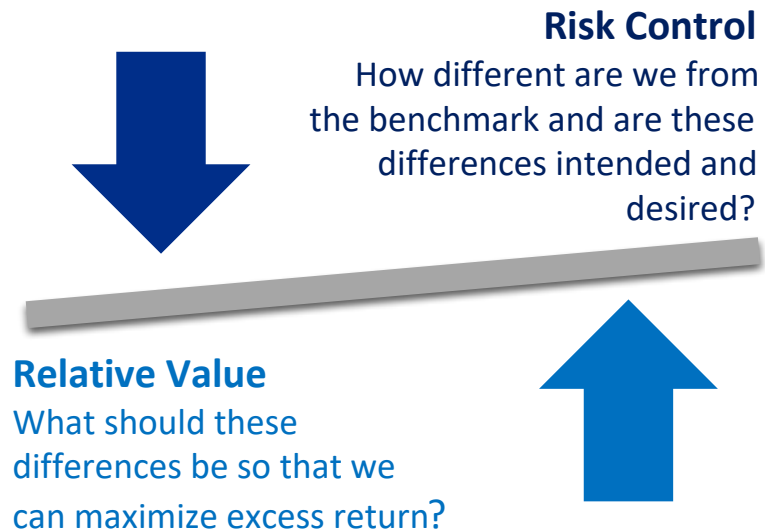


Source: BNY Mellon  
As of 2/29/2024

# Overview: Philosophy

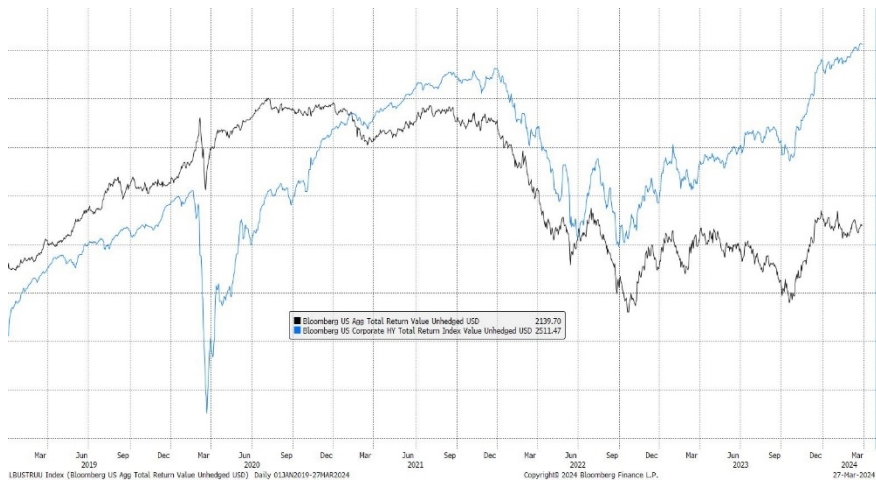
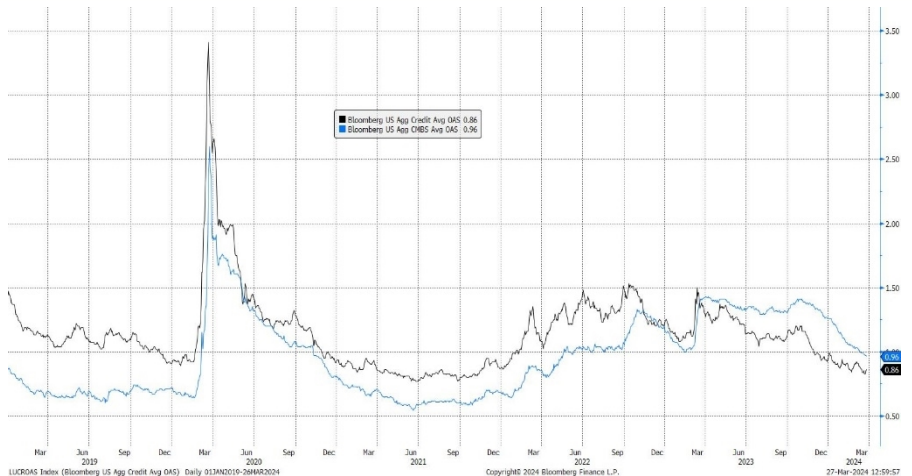
## Risk Controlled Relative Value

Market factors provide opportunities to add value through optimal sector allocation and security selection, while managing risk exposures to the benchmark within controlled parameters



**The Fixed Income Program serves as a diversifying asset class, historically providing a hedge against a deflationary economic environment.**

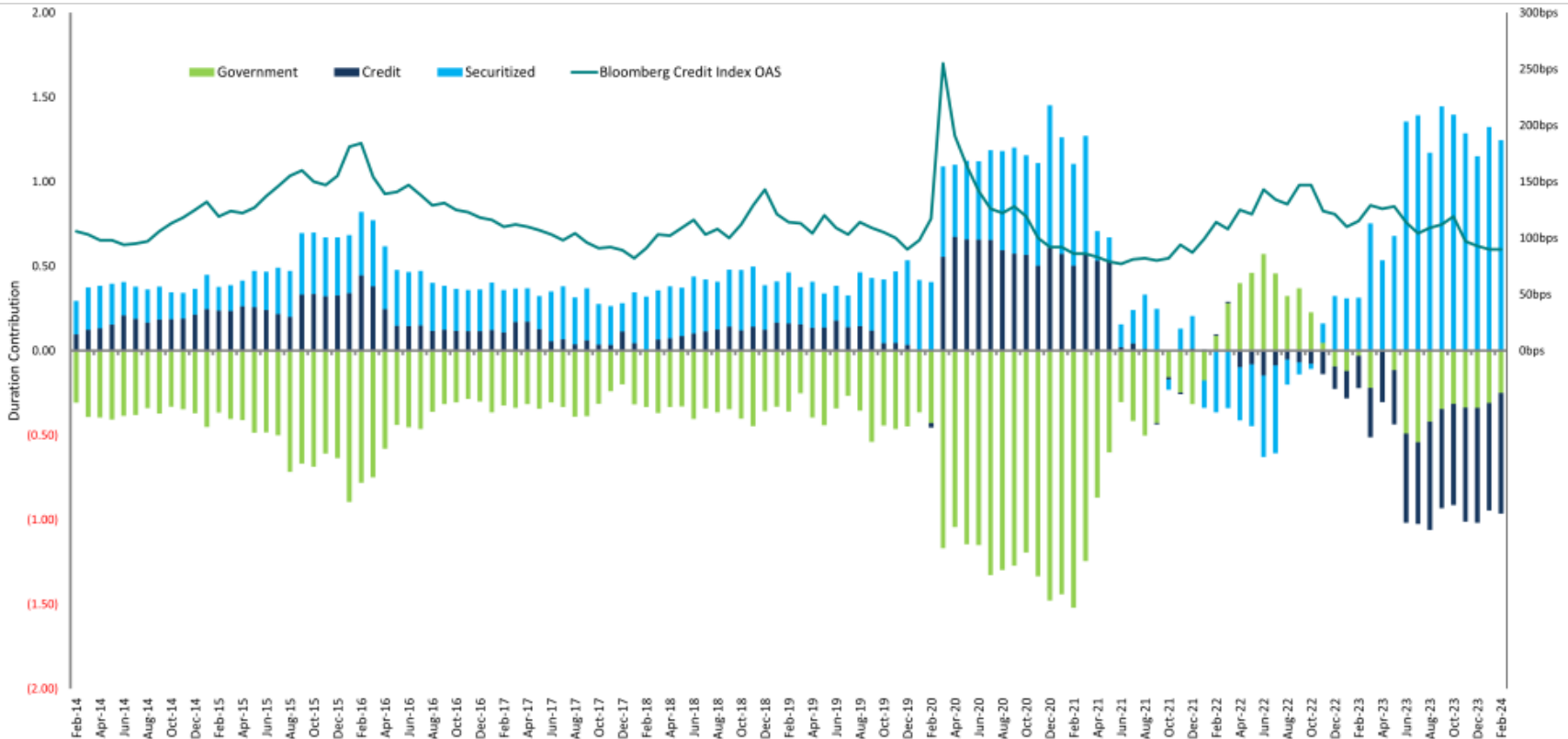
# Markets: Data: Jan 2019 - Mar 2024



Source: Bloomberg  
As of 3/27/2024

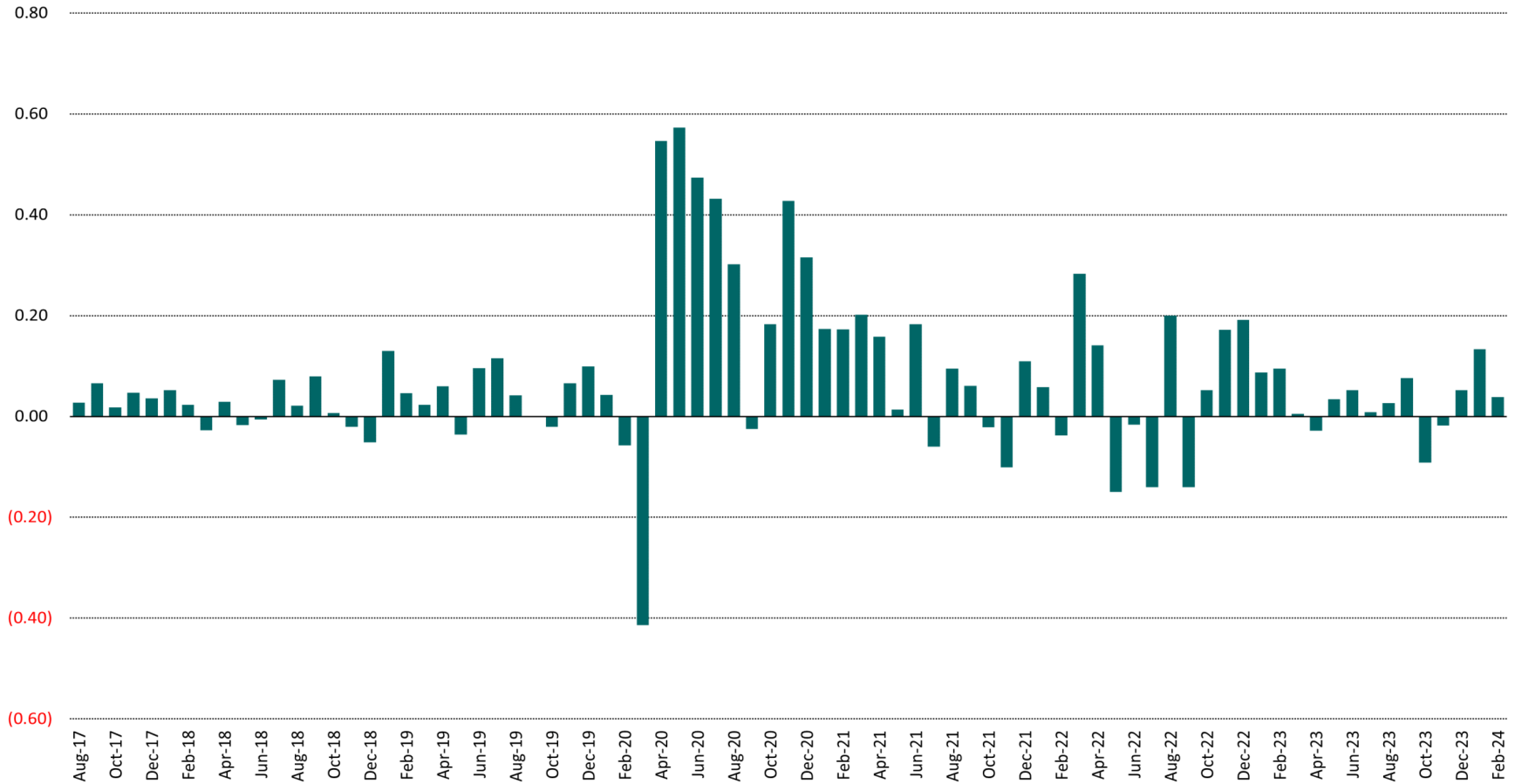


# Markets: History of Core Sector Tilts



Source: Aladdin, Bloomberg  
As of 2/29/2024

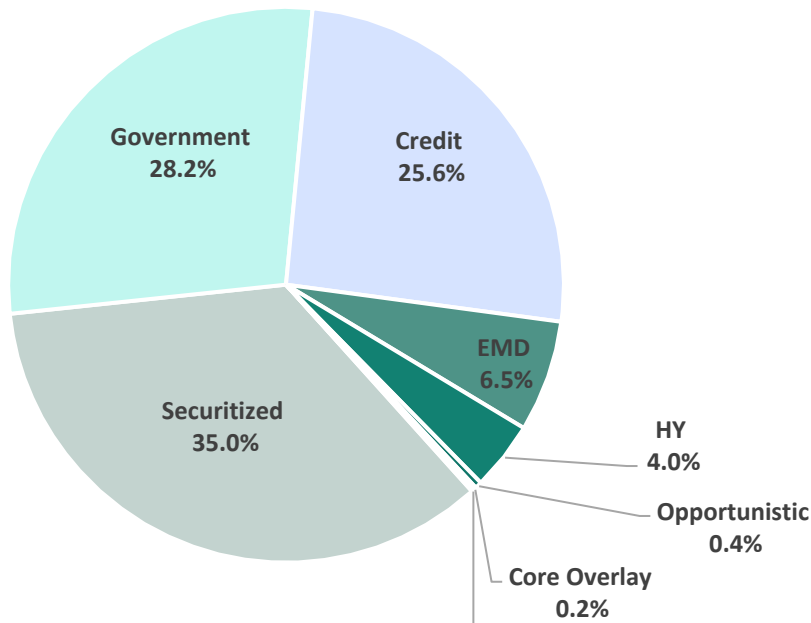
# Markets: Program Monthly Excess Returns



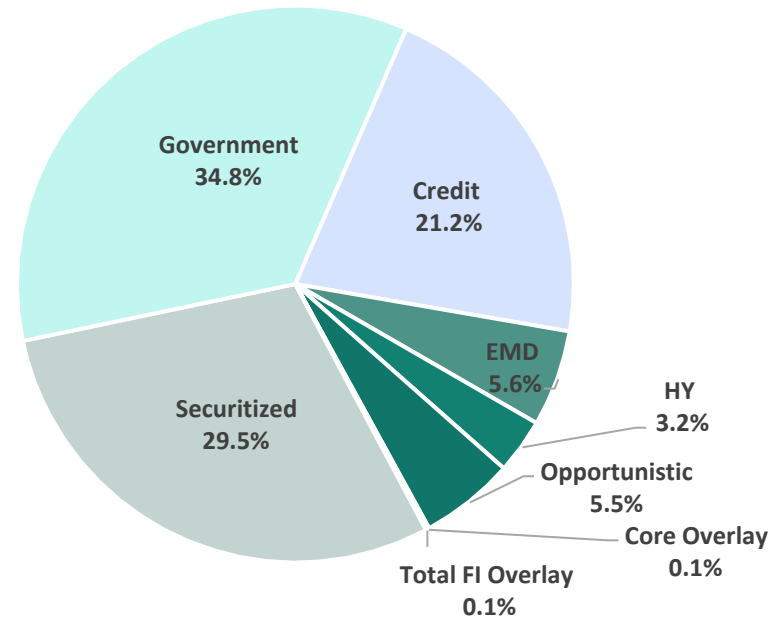
Source: BNY Mellon, VRS  
As of 2/29/2024

# Exposures: Portfolio Positioning Over Time

**12/31/2022**  
\$12.4 Billion



**02/29/2024**  
\$15.8 Billion



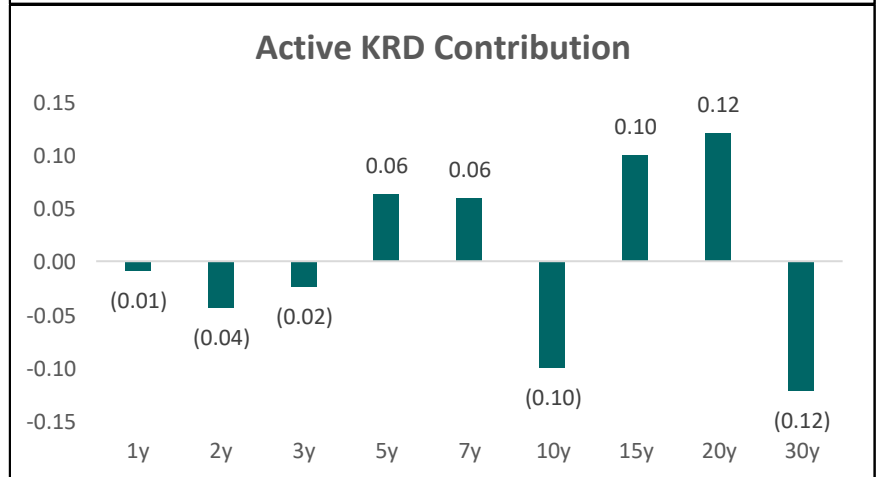
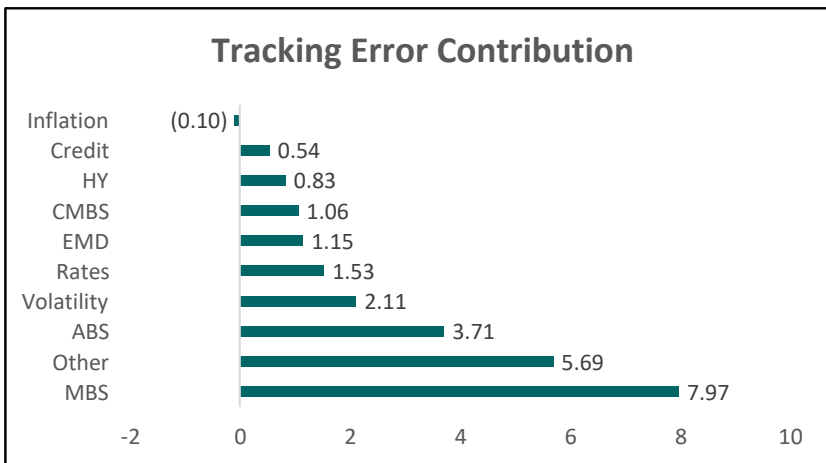
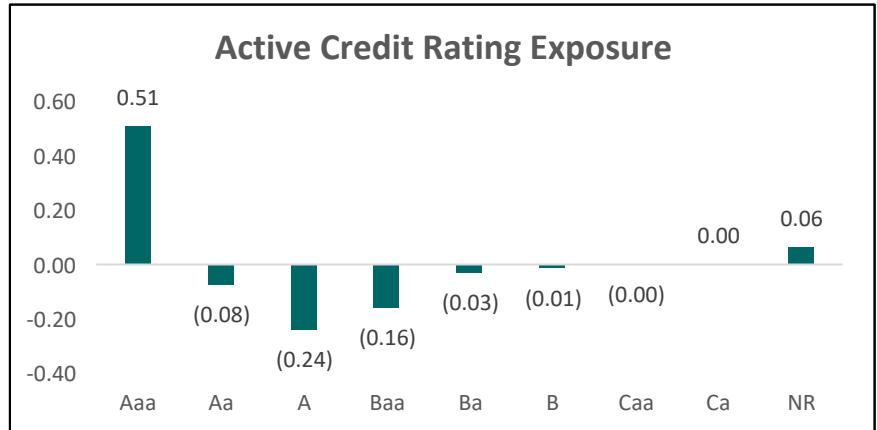
Portfolio	Dec-22	Feb-24	Difference	Portfolio	Dec-22	Feb-24	Difference
Securitized	35.0%	29.5%	-5.5%	High Yield	4.0%	3.2%	-0.8%
Government	28.2%	34.8%	+6.6%	Opportunistic	0.4%	5.5%	+5.1%
Credit	25.6%	21.2%	-4.4%	Core Overlay	0.2%	0.1%	-0.1%
Emerging Market Debt	6.5%	5.6%	-0.9%	Total FI Overlay	0.1%	0.1%	0.0%

As of 2/29/2024

# Exposures: Portfolio Characteristics

**Total Fixed Income Program Market Value: \$15.8 Billion**

Portfolio Characteristics			
	Port	Bench	Diff
Effective Duration	6.08	6.03	0.05
Yield to Maturity	5.25	5.12	0.13
Option Adj. Spread	69	59	10



Source: Aladdin  
As of 2/29/2024

# Results:

## Core Portfolio Attribution Factors For CY'23



### Program Level

- The Fed has held rates steady at 5.25-5.50% since September 2023
- The Fed continues to signal towards “higher for longer” as they wait for “more good” data – resulting in heightened volatility surrounding key data dates
- Two months into 2024 the markets went from pricing 7 rate cuts this year to 3

### Portfolio Level

- Fixed Income policy weight is now 16% which is an increase of 1% - received an inflow of \$1 billion at the start of February as part of a total Fund reallocation inflow
- Fixed income portfolios opportunistically reallocated to maintain our defensive positioning
- Team worked vigilantly to use active portfolio positioning to take advantage of opportunities and dislocations within sectors
- Security selection added considerably to the Program’s excess return for CY’23

# Results: FI Program Risk/Return Characteristics



Program Excess Return and Statistics				
	10 Year	5 Year	3 Year	1 Year
<b>Core IFI Program</b>	<b>0.76</b>	<b>1.08</b>	<b>0.63</b>	<b>0.36</b>
Tracking Error	0.42	0.53	0.30	0.20
Information Ratio	1.81	2.04	2.09	1.76
<b>Total FI Program</b>	<b>0.78</b>	<b>1.07</b>	<b>0.56</b>	<b>0.30</b>
Tracking Error	0.46	0.59	0.37	0.20
Information Ratio	1.69	1.80	1.54	1.55

## 10 Year Batting Average

Monthly Excess Returns		
Core IFI Program	90/120	75%

Source: BNY Mellon, Aladdin, VRS  
As of 02/29/2024

# Results:

## Core Portfolio Risk/Return Characteristics



### Portfolio Excess Return and Statistics

	10 Year	5 Year	3 Year	1 Year
<b>Government</b>	<b>0.29</b>	<b>0.32</b>	<b>0.26</b>	<b>0.34</b>
Tracking Error	0.16	0.20	0.14	0.07
Information Ratio	1.84	1.54	1.87	4.94
<b>Securitized</b>	<b>0.86</b>	<b>1.41</b>	<b>1.52</b>	<b>0.96</b>
Tracking Error	0.70	0.96	1.05	0.56
Information Ratio	1.23	1.47	1.45	1.72
<b>Credit</b>	<b>0.66</b>	<b>0.68</b>	<b>0.31</b>	<b>(0.15)</b>
Tracking Error	0.30	0.32	0.30	0.18
Information Ratio	2.17	2.12	1.04	(0.80)
<b>Opportunistic</b>	<b>–</b>	<b>1.58</b>	<b>1.79</b>	<b>2.44</b>
Tracking Error	–	1.89	2.31	1.47
Information Ratio	–	0.84	0.78	1.66

Source: BNY Mellon, Aladdin, VRS  
As of 02/29/2024

# Results: EM/HY Portfolio Risk/Return Characteristics



Portfolio Excess Return and Statistics			
	Since Inception*	3 Year	1 Year
<b>Internal EMD</b>	<b>0.63</b>	<b>0.82</b>	<b>0.83</b>
Tracking Error	0.93	1.06	0.90
Information Ratio	0.67	0.78	0.92
<b>Payden &amp; Rygel EMD</b>	<b>0.98</b>	<b>0.61</b>	<b>(0.13)</b>
<b>PIMCO EMD</b>	<b>1.00</b>	<b>0.85</b>	<b>0.50</b>
<b>Internal High Yield</b>	<b>0.54</b>	<b>1.10</b>	<b>(0.06)</b>
Tracking Error	1.28	1.34	1.38
Information Ratio	0.42	0.82	(0.05)
<b>Man Numeric High Yield</b>	<b>0.82</b>	<b>0.54</b>	<b>1.07</b>

\*Inception dates: Internal EMD Portfolio 11/2018, Internal HY Portfolio 7/2019, External EMD Portfolio 1/2020, Man Numeric HY 7/2020

Source: BNY Mellon, Aladdin, VRS

As of 02/29/2024



# Looking Forward: Where Are We Focusing?

**Continue To Implement Long Term Vision For The Program**

**Actively Find Ways To Collaborate Across Teams to Add Value to VRS**

## **On The Radar**

- Enhancements to portfolio processes and portfolio management tools
- Emphasize cross training throughout the program
- Cross-asset class working groups to enhance expertise
- Expand into more value-adding ideas in the Opportunistic Portfolio

# Collaboration: Across the Fund

## Portfolios

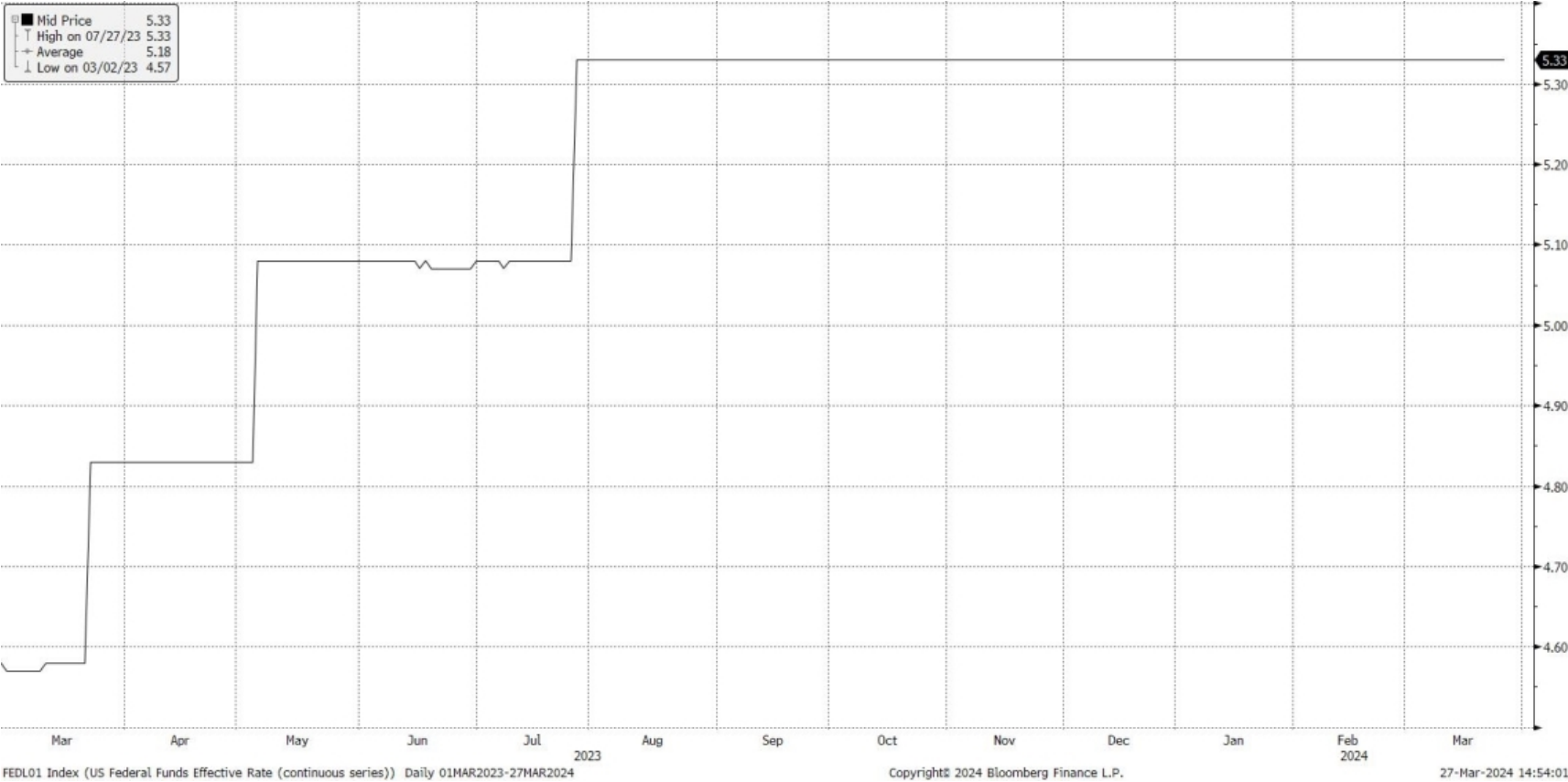
- Leverage: Fixed Income Leverage
- IEM: Systematic High Yield & Total Fund Rebalance Portfolio
- RBI: RBI Risk Hedging Portfolio
- Operations: Collateral Management Portfolio

## People

- Intentional touch points across programs
- External manager partnership sessions
- Factor based investing and quantitative tool exploration
- Individual team member collaboration

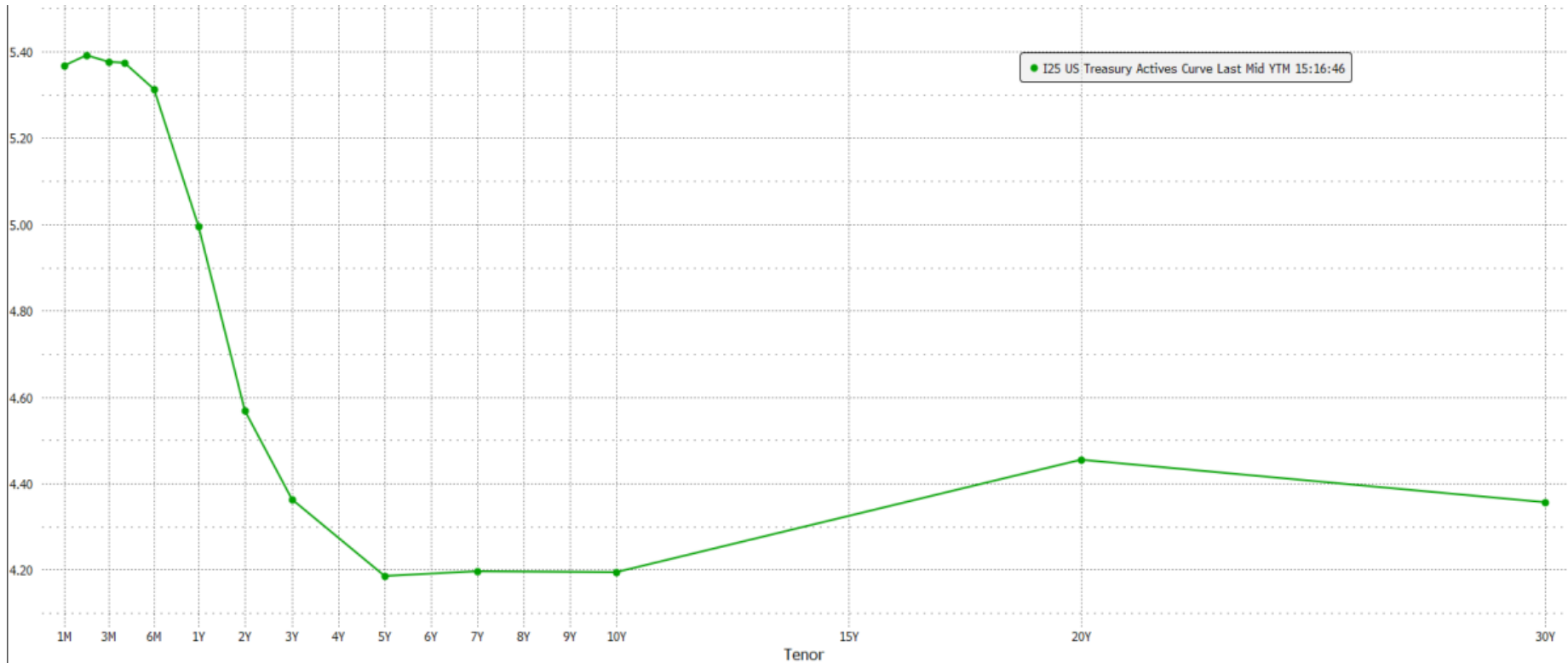
# Appendix

# Markets: Fed Rate Hike Cycle



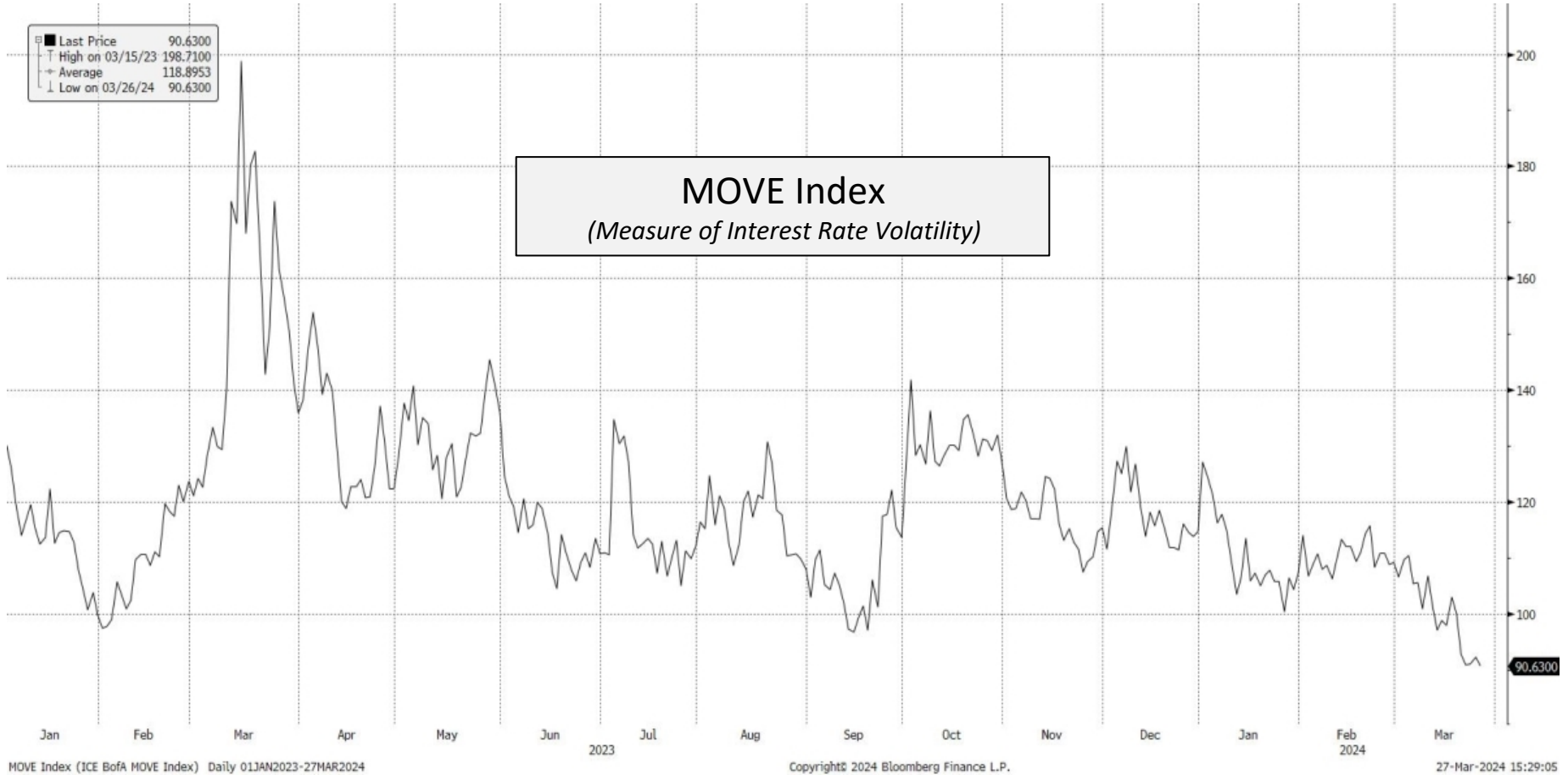
Source: Bloomberg  
 As of 03/18/2024

# Markets: Yield Curve Inversion



Source: Bloomberg  
As of 03/18/2024

# Markets: Interest Rate Volatility Moderated



Source: Bloomberg  
As of 03/18/2024

March 2024

# Benchmark & Performance Hurdle Analysis

Virginia Employees Retirement System



# Virginia's Benchmark Definitions

Program	Benchmark Definition(s)
Public Equity	85% MSCI ACWI IMI (net VRS Tax Rate) and 15% MSCI World Min. Volatility (net VRS Tax Rate)
Fixed Income	90% Bloomberg US Aggregate Bond Index, 5% BB US High Yield Ba/B 2% Issuer Cap, and 5% JP Morgan EMBI Global Core Index
Credit Strategies	50% Morningstar LSTA Performing Loan Index and 50% BB US High Yield Ba/B 2% Issuer Cap
Real Assets	Market value weighted blend of NCREIF Private Real Estate Benchmark (ODCE Index) lagged by three months and other real assets custom benchmark (CPI-U + 400 bps lagged by three months)
Private Equity	Regional benchmarks of the MSCI ACWI IMI index (net VRS taxes) lagged by three months weighted to reflect the Private Equity opportunity set (75% North America, 20% Europe, and 5% Asia and Emerging Markets).
Multi-Asset Public Strategies, Dynamic Strategies, and RBI	ICE BofA US 3-Month Treasury Bill Index + 250 bps
Private Investment Partnerships (PIP)	33% Private Equity Custom Benchmark, 25% NCREIF Private Real Estate Benchmark, 8% Other Real Assets Custom Benchmark, 17% BB US High Yield Ba/B 2% Issuer Cap, 17% Morningstar LSTA Performing Loan Index
Leverage	Secured Overnight Financing Rate (SOFR) + 50 bps
Total Fund	33% Public Equities, 16% Fixed Income, 14% Credit Strategies, 14% Real Assets, 16% Private Equity, 4% Multi-Asset Public Strategies, 2% PIP, 2% Cash, and -1% Leverage



# Benchmark Summary

RVK reviewed Virginia Employees Retirement System's ("VRS") investment policy statement, historical performance, current and historical benchmark and policy definitions, and current and historical incentive compensation hurdles.

We compared the benchmarks and policies to RVK's public defined benefit plans with assets over \$7.5 billion and a custom public universe that RVK produces annually. Each plan is unique and the composite and total fund benchmarking used by these plans are unique to them but the sentiment between them was similar.

The analysis indicated that VRS uses similar investment factors to its peers.

Besides peer comparison's we analyzed the benchmarks performance to their respective composite performance to approve of the fit. The analysis starts on page 15 and includes a rolling three and five-year beta and R-Squared calculation.

- An R-Squared calculation measures the strength or fit of the benchmark to the performance calculations.

The analysis also indicated the benchmarks are appropriate.

RVK also reviewed the leverage benchmark of SOFR + 50 bps. VRS' borrowing costs are in line with RVK's clients that use leverage. All RVK clients are using or changing to a SOFR reference benchmark and using a hurdle in the 40 to 60 bps range.

*RVK found all the benchmarks used by VRS to be appropriate and reflective of the current investment environment and do not recommend any changes.*

# Performance Hurdles Summary

VRS Program	Current Hurdle (bps)	Recommended Hurdle (bps)
Fixed Income	25	25
Credit Strategies	75	75
Public Equity	30	30
Internal Equity	25	25
Private Equity	200	200
Real Assets	75	75
<b>Total Fund</b>	<b>45</b>	<b>45</b>

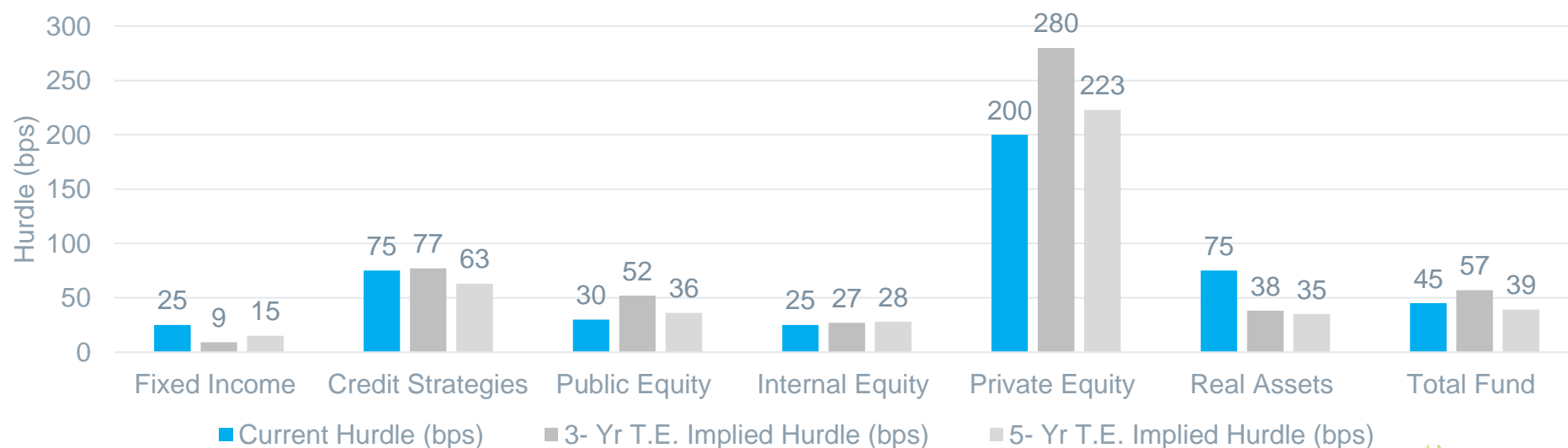
RVK is not recommending any changes to the current hurdle rates. Most were changed in 2020.

Four asset classes: fixed income, internal equity, private equity, and real assets have a win/loss greater than 50% on both the three and five year time periods.

Public equities had a win/loss ratio of less than 50% on both the three and five year time periods.

The rest: total fund and credit strategies were mixed in their win/loss ratio.

Recommended Hurdle Rate by Asset Class



# Virginia Retirement System **Performance Hurdle Analysis**

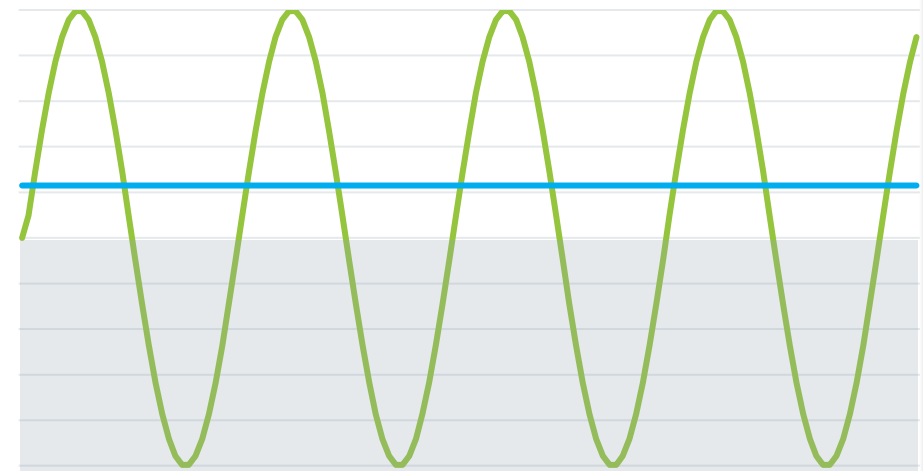


# Methodology

- A program with higher levels of active risk would be expected to exhibit larger positive and negative swings in excess returns.
- Due to the asymmetric nature of incentive compensation, payouts aren't mirrored between outperformance and underperformance.
- We can calculate the expected value of an incentive program assuming no alpha and normally distributed excess returns.

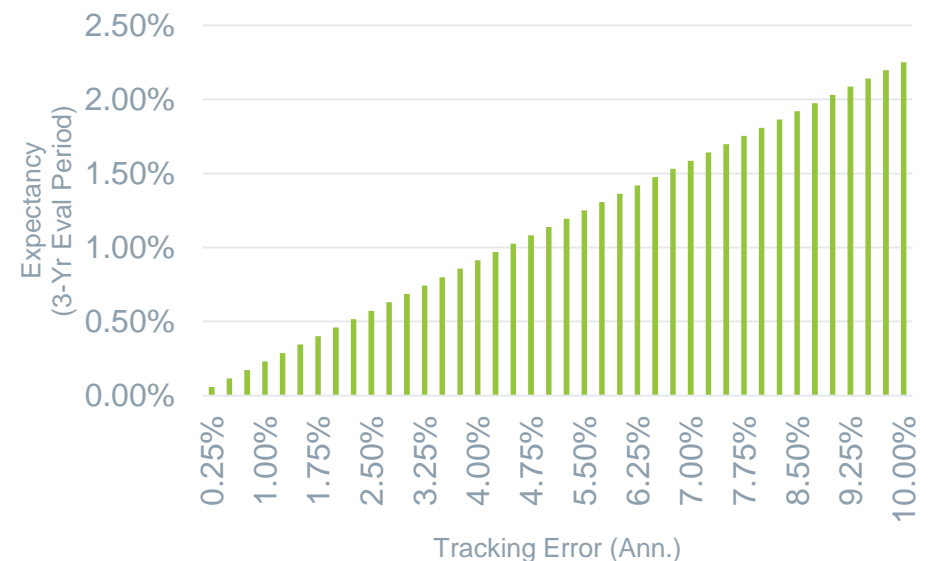
$$y \sqrt{1 + T \frac{1}{\sqrt{2\pi}} \sqrt{y} - 1}$$

- A hurdle rate based on the program's tracking error should remove compensation generated purely from "noise" over the long run.
- Because noise tends to cancel out over time, it is important to consider the evaluation period used for compensation to avoid overstating the hurdle rate.



— Alpha — Expectancy of Incentive

\*for illustrative purposes only



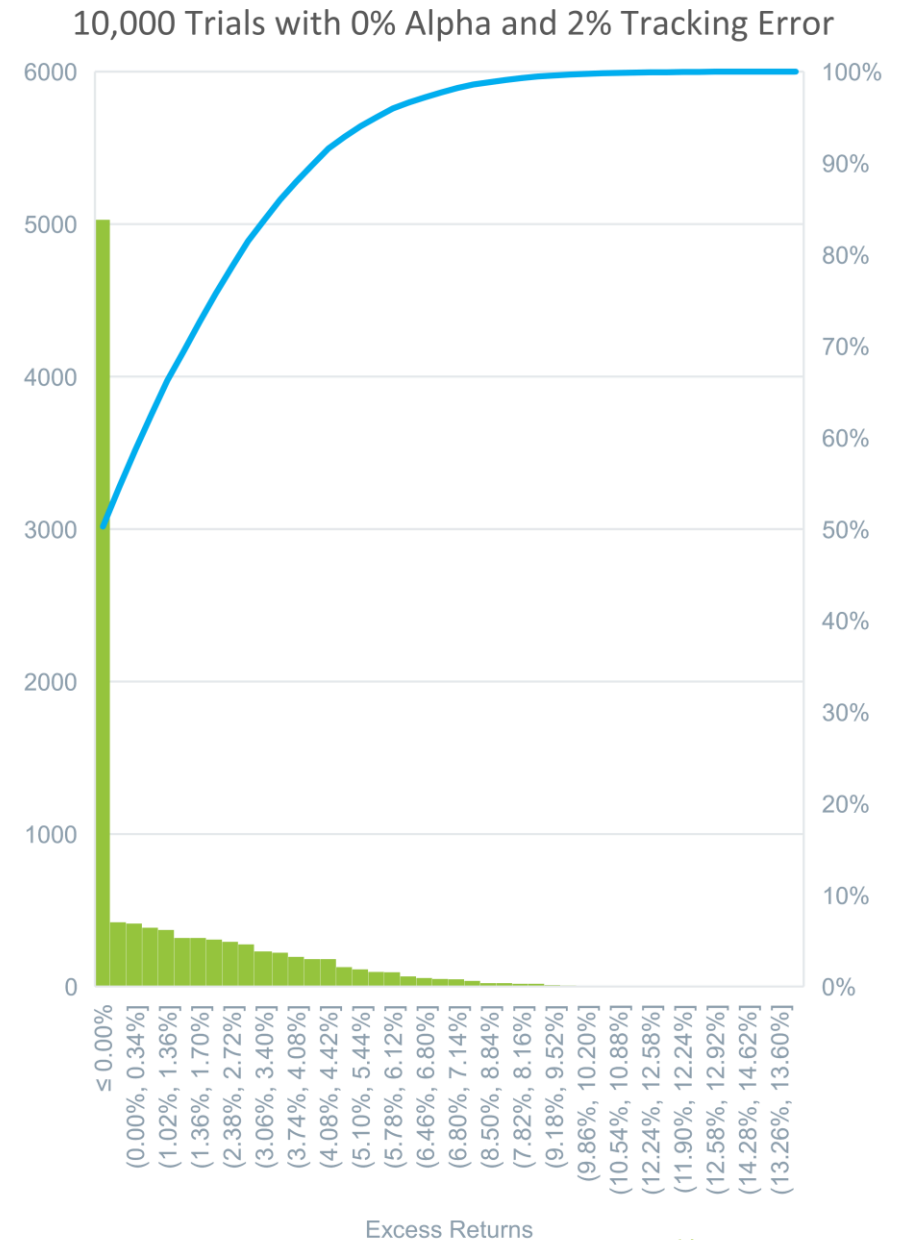
In the provided formula,  $y$  = number of years in the performance evaluation,  $T$  = tracking error, and  $\frac{1}{\sqrt{2\pi}}$  is the probability density function of a normal distribution with a mean of 0 and a standard deviation of 1.

# Example

- Assuming a tracking error of 2.00% and an evaluation period of 3 years, we can calculate the following hurdle:

$$\sqrt[3]{1 + .02 \frac{1}{\sqrt{2\pi}} \sqrt{3}} - 1$$

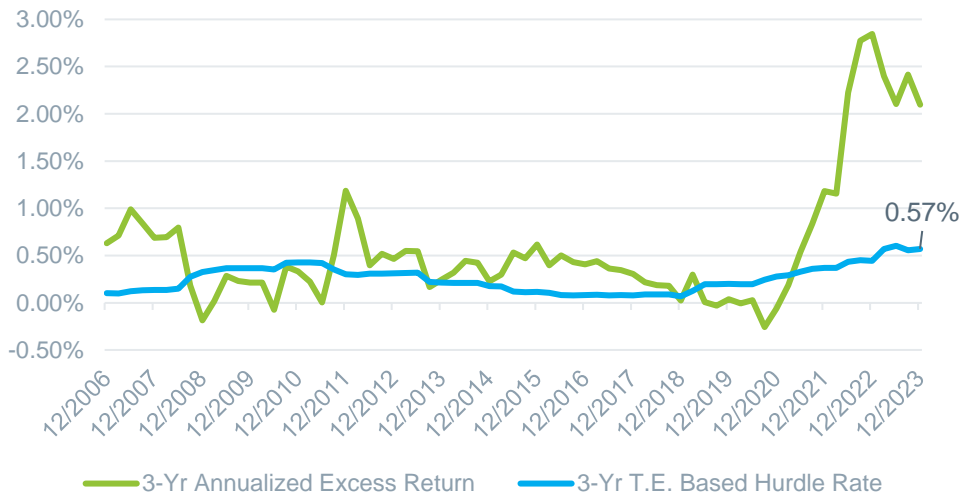
- This results in an expected incentive compensation of 46 bps, assuming no skill.
- A Monte Carlo simulation using alpha of 0% and tracking error of 2% reveals the same outcome of 46 basis points per year across 10,000 trials.
- Limitations: If negative skew is present, the hurdle rate may be understated. If kurtosis is wider than assumed in a normal distribution, larger swings will occur more frequently and may also result in an understated hurdle rate.



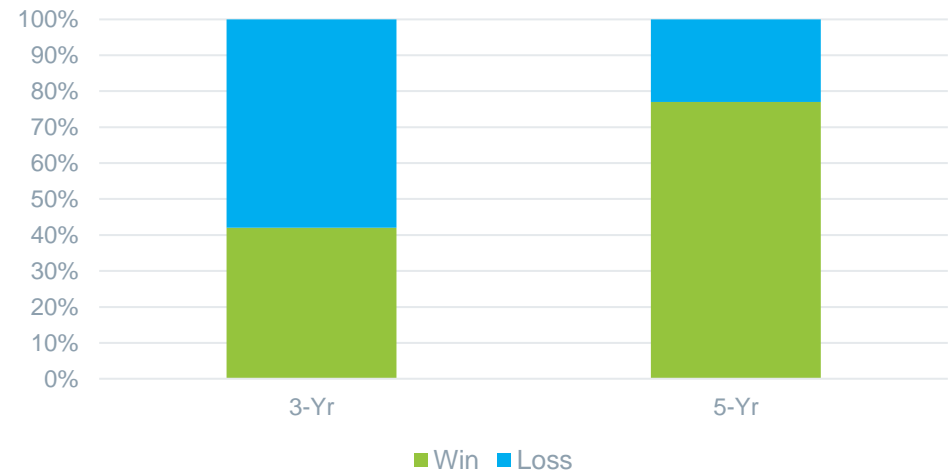
In the provided formula,  $y$  = number of years in the performance evaluation,  $T$  = tracking error, and  $\frac{1}{\sqrt{2\pi}}$  is the probability density function of a normal distribution with a mean of 0 and a standard deviation of 1.

# Total Fund

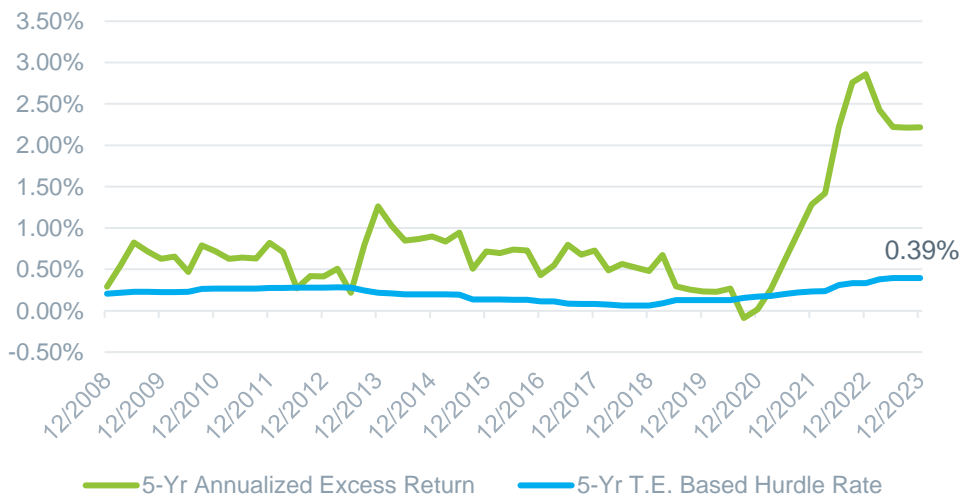
### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle

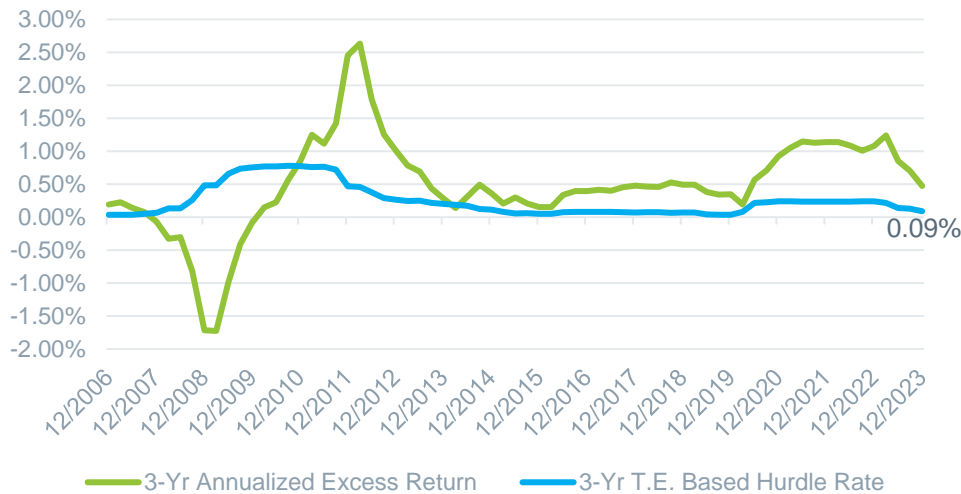


Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	42%	77%
Longest Consecutive Periods Above Hurdle (Quarters)	11	13
Longest Consecutive Dates Above Hurdle	06/30/2021 - 12/31/2023	03/31/2009 - 03/31/2012
Longest At or Below Hurdle (Quarters)	19	8
Longest Consecutive Dates Below Hurdle	09/30/2016 - 03/31/2021	06/30/2019 - 03/31/2021
Total Periods Evaluated	69	61

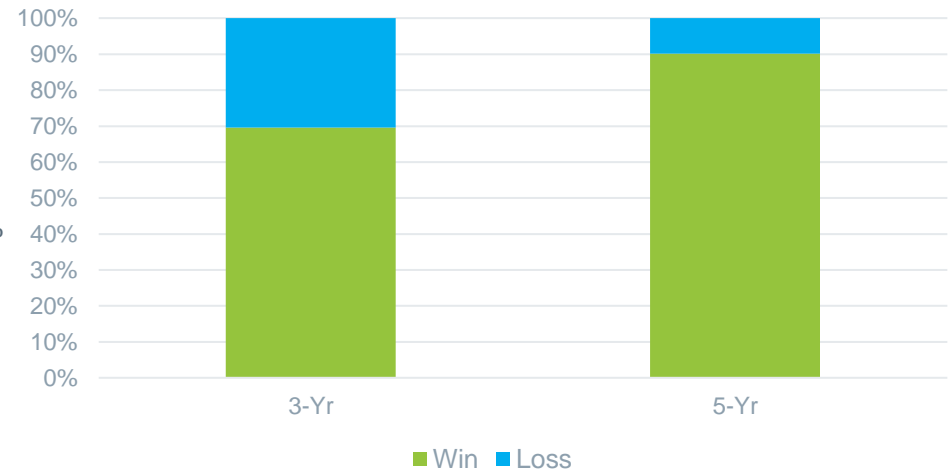
Current Hurdle: 45 bps

# Fixed Income

### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle

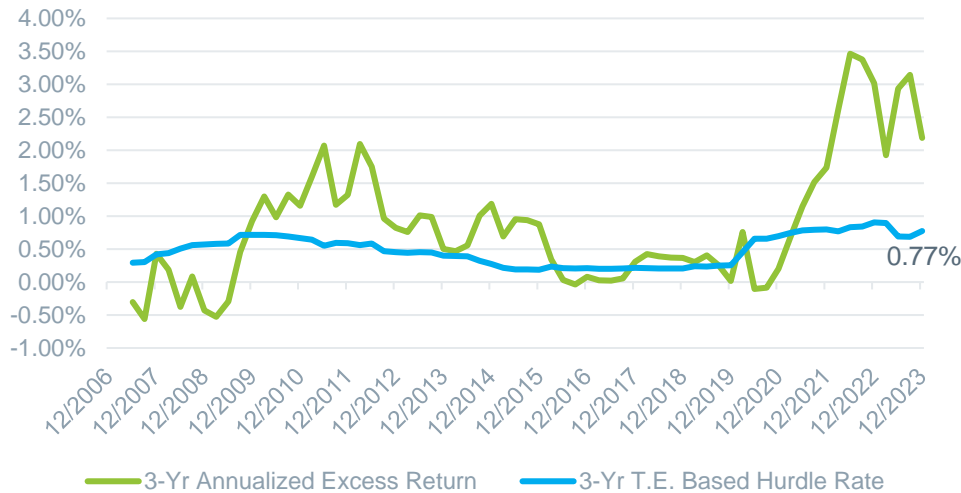


Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	70%	90%
Longest Consecutive Periods Above Hurdle (Quarters)	15	55
Longest Consecutive Dates Above Hurdle	06/30/2016 - 12/31/2019	06/30/2010 - 12/31/2023
Longest At or Below Hurdle (Quarters)	15	6
Longest Consecutive Dates Below Hurdle	12/31/2006 - 06/30/2010	12/31/2008 - 03/31/2010
Total Periods Evaluated	69	61

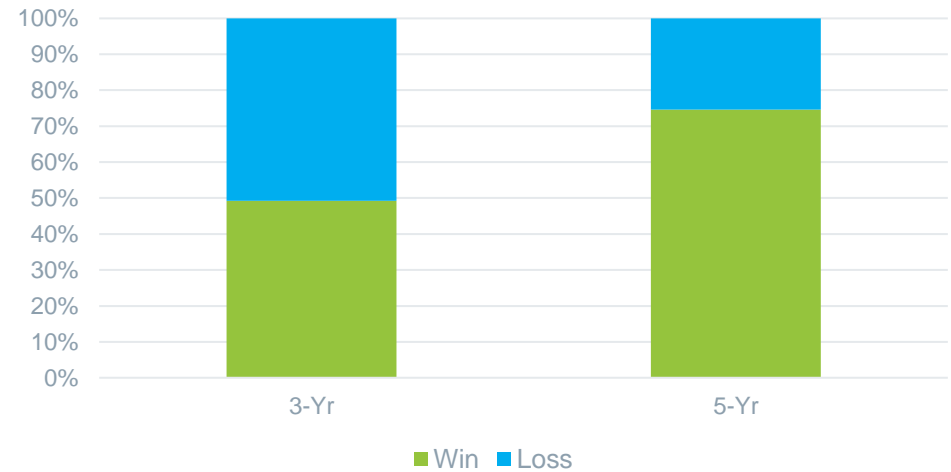
Current Hurdle: 25 bps

# Credit Strategies

### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle



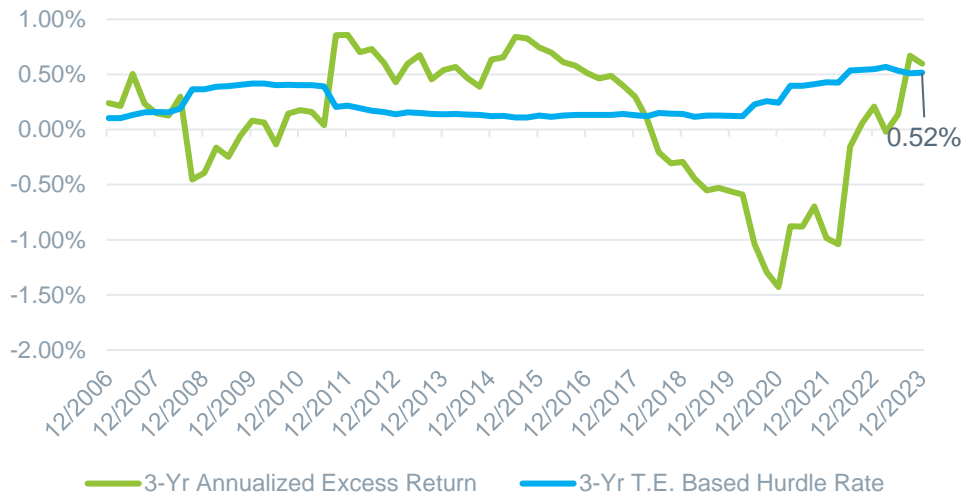
Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	49%	75%
Longest Consecutive Periods Above Hurdle (Quarters)	16	24
Longest Consecutive Dates Above Hurdle	12/31/2009 - 09/30/2013	03/31/2010 - 12/31/2015
Longest At or Below Hurdle (Quarters)	16	7
Longest Consecutive Dates Below Hurdle	03/31/2016 - 12/31/2019	06/30/2018 - 12/31/2019
Total Periods Evaluated	67	59

Current Hurdle: 75 bps

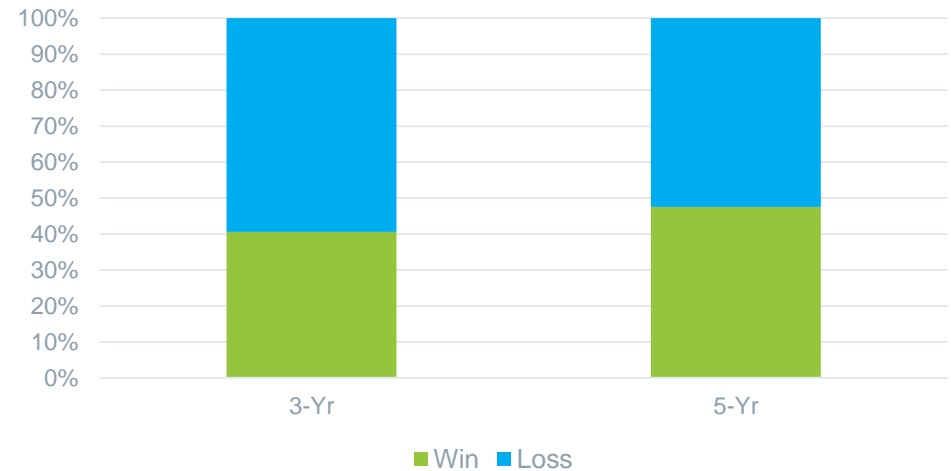


# Public Equity

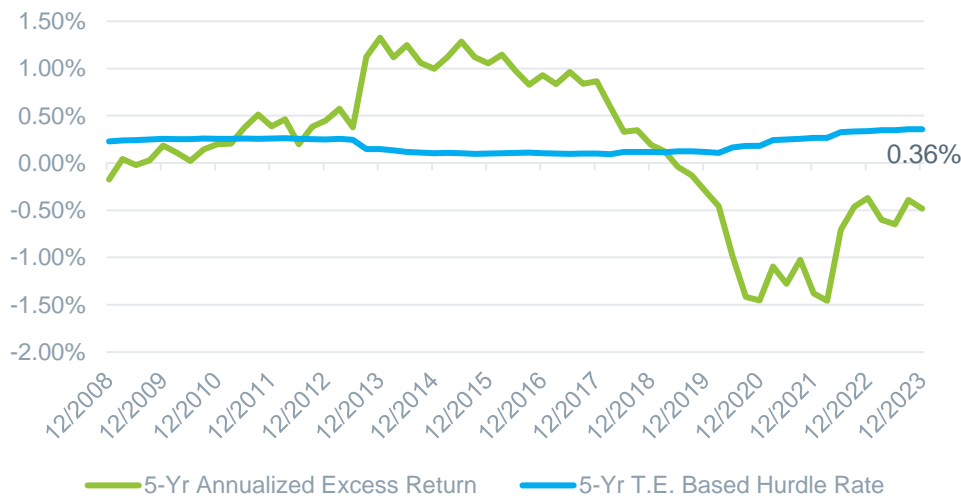
### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle

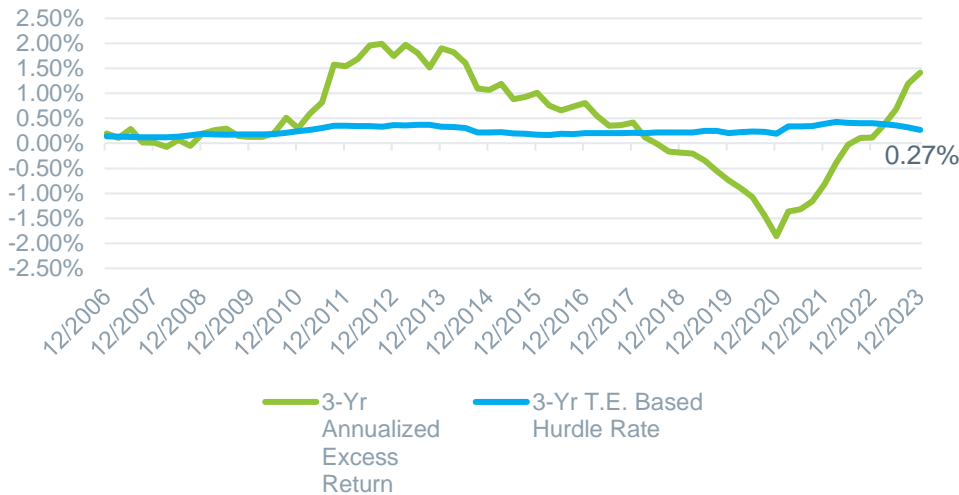


Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	41%	48%
Longest Consecutive Periods Above Hurdle (Quarters)	25	25
Longest Consecutive Dates Above Hurdle	09/30/2011 - 09/30/2017	09/30/2012 - 09/30/2018
Longest At or Below Hurdle (Quarters)	23	21
Longest Consecutive Dates Below Hurdle	12/31/2017 - 06/30/2023	12/31/2018 - 12/31/2023
Total Periods Evaluated	69	61

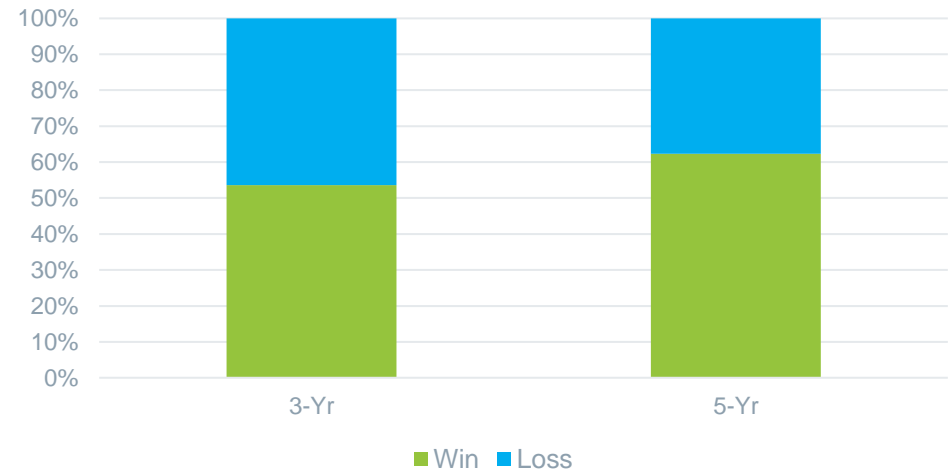
Current Hurdle: 30 bps

# Internal Equity

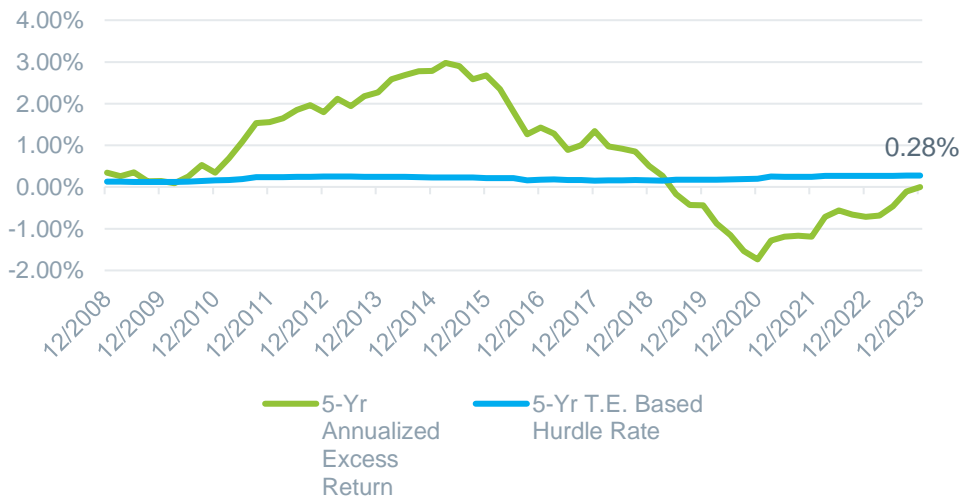
### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle

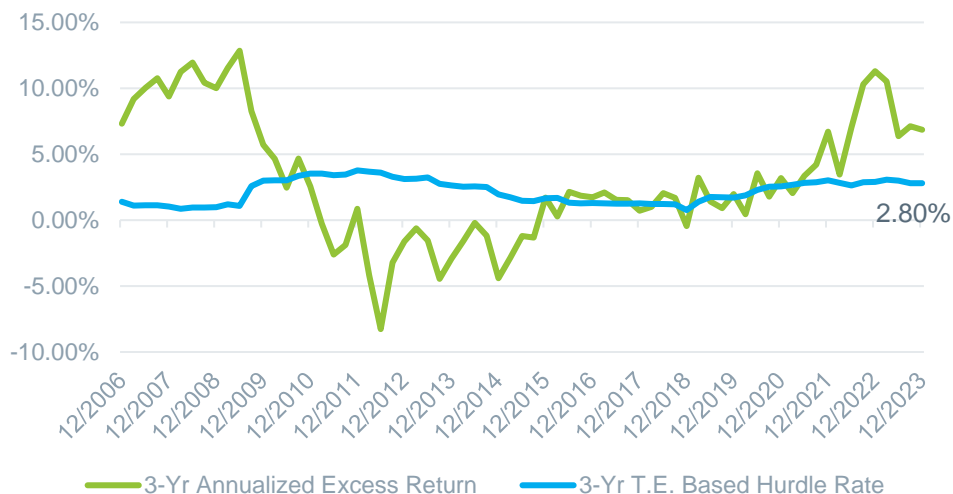


Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	54%	62%
Longest Consecutive Periods Above Hurdle (Quarters)	30	35
Longest Consecutive Dates Above Hurdle	09/30/2010 - 12/31/2017	09/30/2010 - 03/31/2019
Longest At or Below Hurdle (Quarters)	20	19
Longest Consecutive Dates Below Hurdle	03/31/2018 - 12/31/2022	06/30/2019 - 12/31/2023
Total Periods Evaluated	69	61

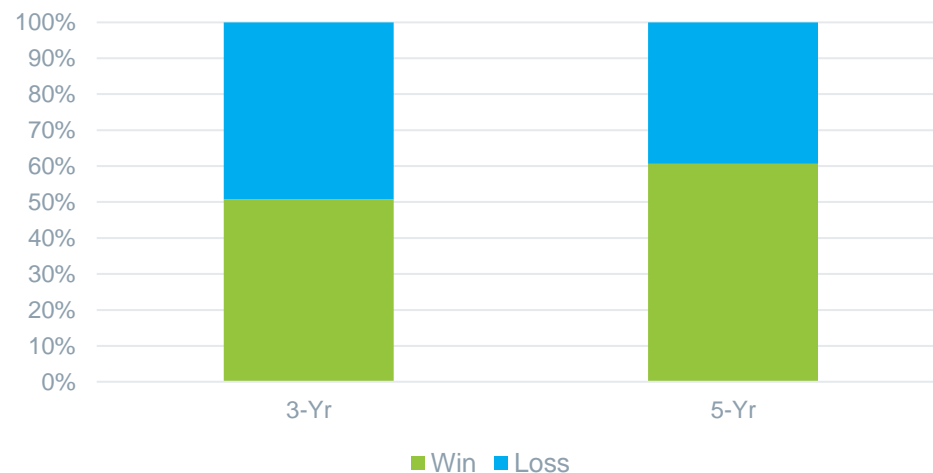
Current Hurdle: 25 bps

# Private Equity

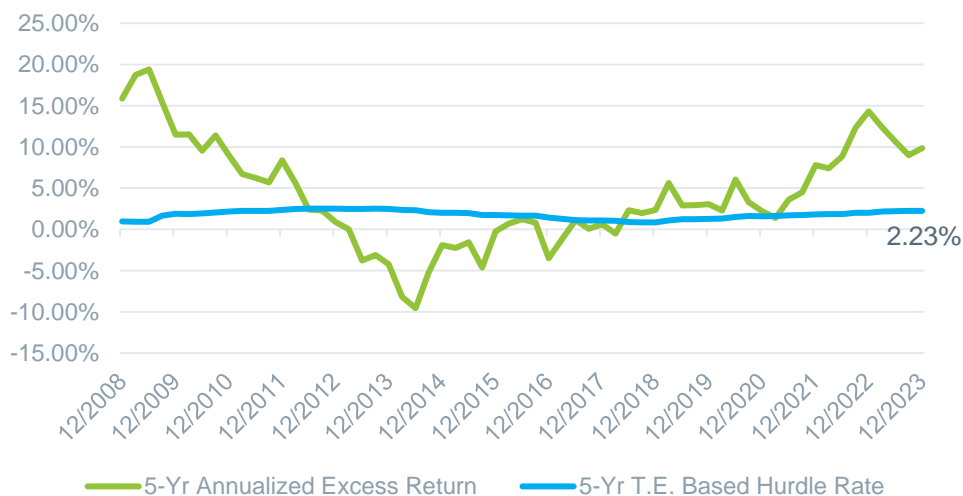
### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle



Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	51%	61%
Longest Consecutive Periods Above Hurdle (Quarters)	17	16
Longest Consecutive Dates Above Hurdle	12/31/2006 - 12/31/2010	12/31/2008 - 09/30/2012
Longest At or Below Hurdle (Quarters)	21	22
Longest Consecutive Dates Below Hurdle	03/31/2011 - 03/31/2016	12/31/2012 - 03/31/2018
Total Periods Evaluated	69	61

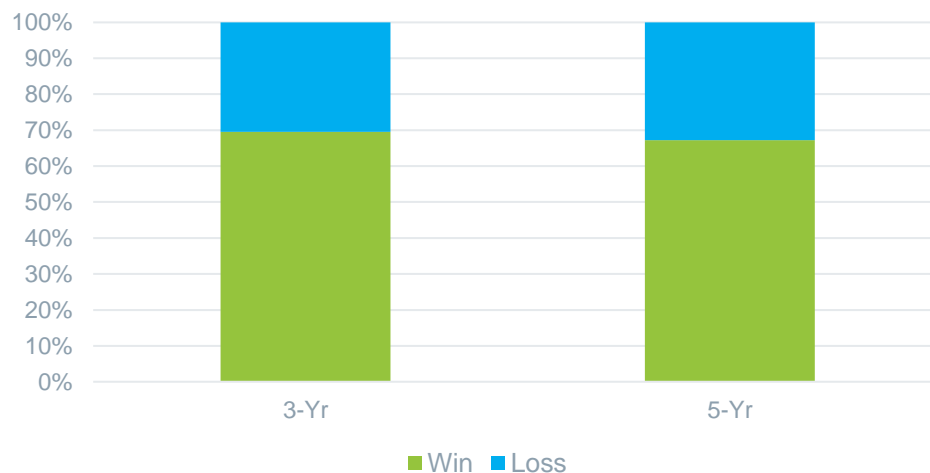
Current Hurdle: 200 bps

# Real Assets

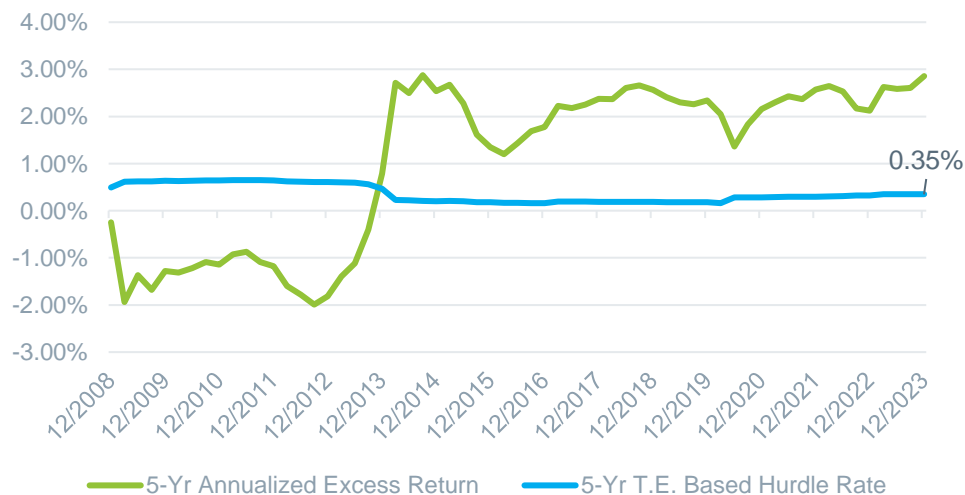
### 3-Yr Rolling Returns vs T.E. Hurdle



### Win/Loss vs Current Hurdle



### 5-Yr Rolling Returns vs T.E. Hurdle



Stats vs Current Hurdle	3-Yr Rolling	5-Yr Rolling
Batting Average	70%	67%
Longest Consecutive Periods Above Hurdle (Quarters)	23	41
Longest Consecutive Dates Above Hurdle	09/30/2014 - 03/31/2020	12/31/2013 - 12/31/2023
Longest At or Below Hurdle (Quarters)	14	20
Longest Consecutive Dates Below Hurdle	09/30/2008 - 12/31/2011	12/31/2008 - 09/30/2013
Total Periods Evaluated	69	61

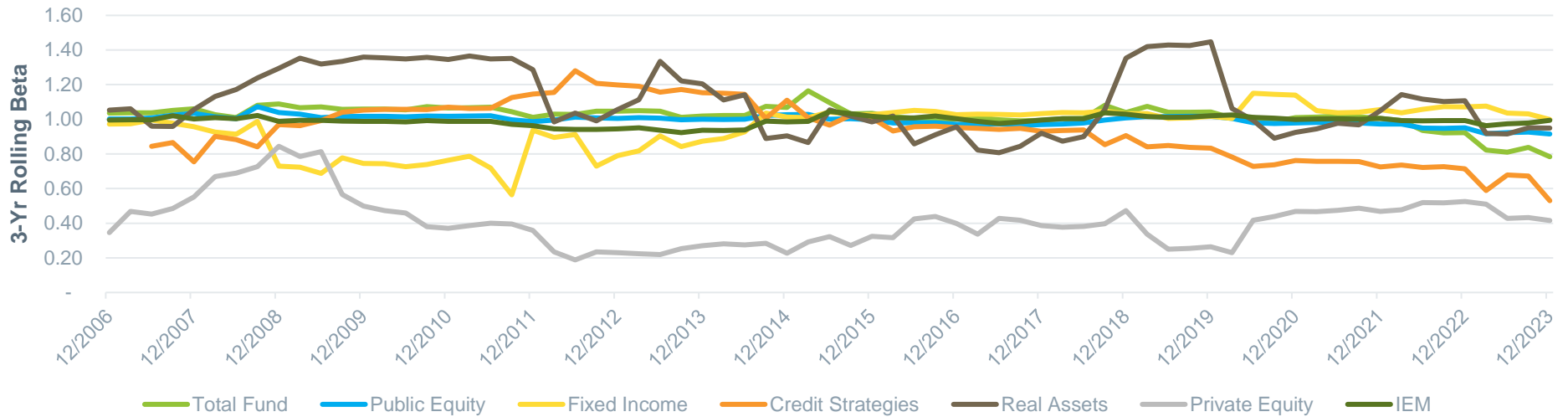
Current Hurdle: 75 bps

# Virginia Retirement System **Benchmark Fit Analysis**

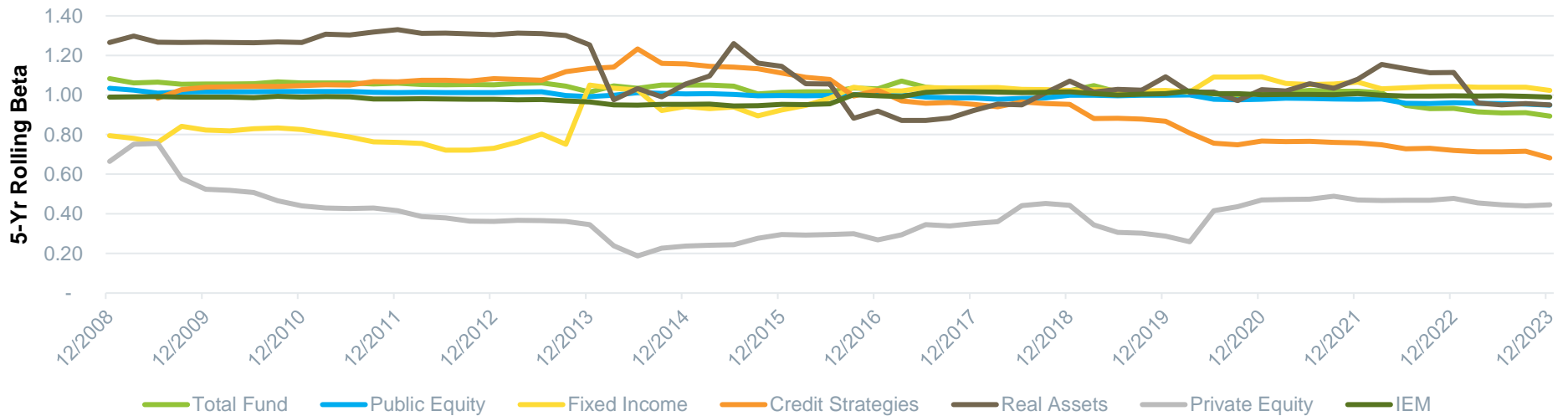


# Program Beta to Respective Benchmarks

## 3-Yr Rolling Beta by Asset Class

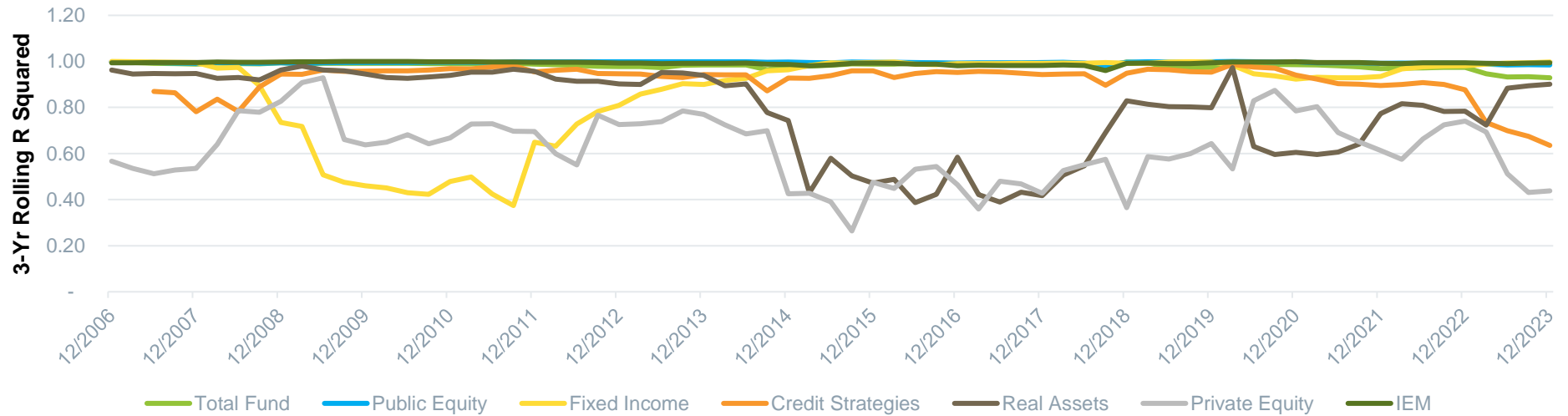


## 5-Yr Rolling Beta by Asset Class

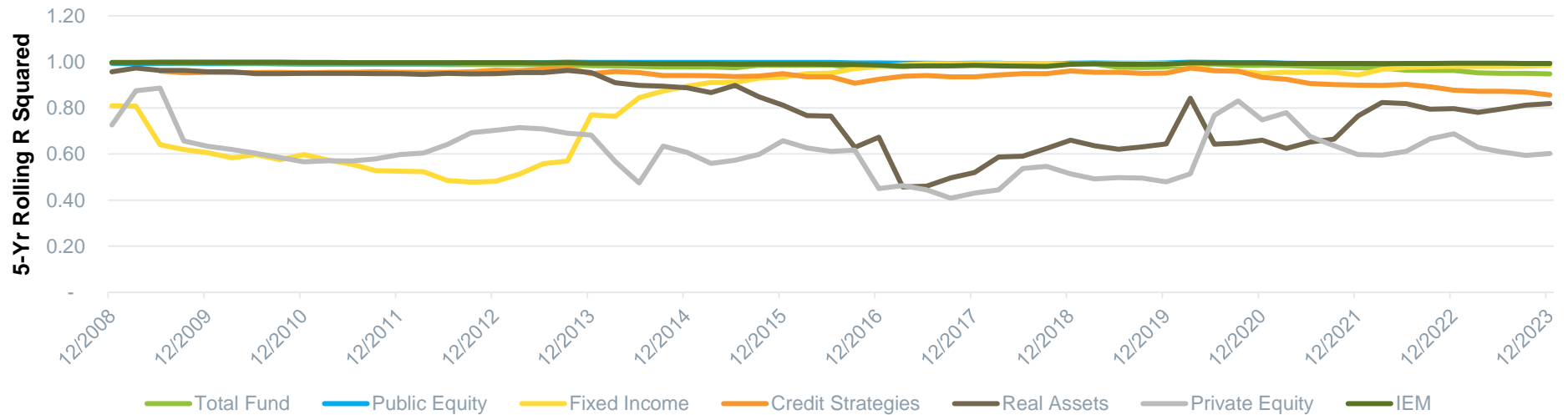


# Program R Squared to Respective Benchmarks

## 3-Yr Rolling R Squared by Asset Class



## 5-Yr Rolling R Squared by Asset Class



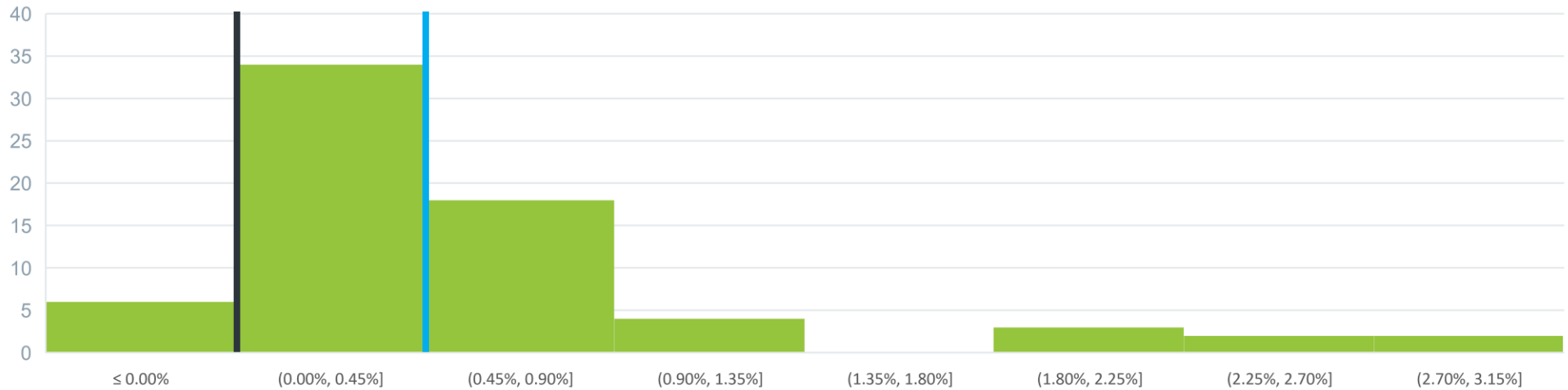
# Virginia Retirement System **Appendix**



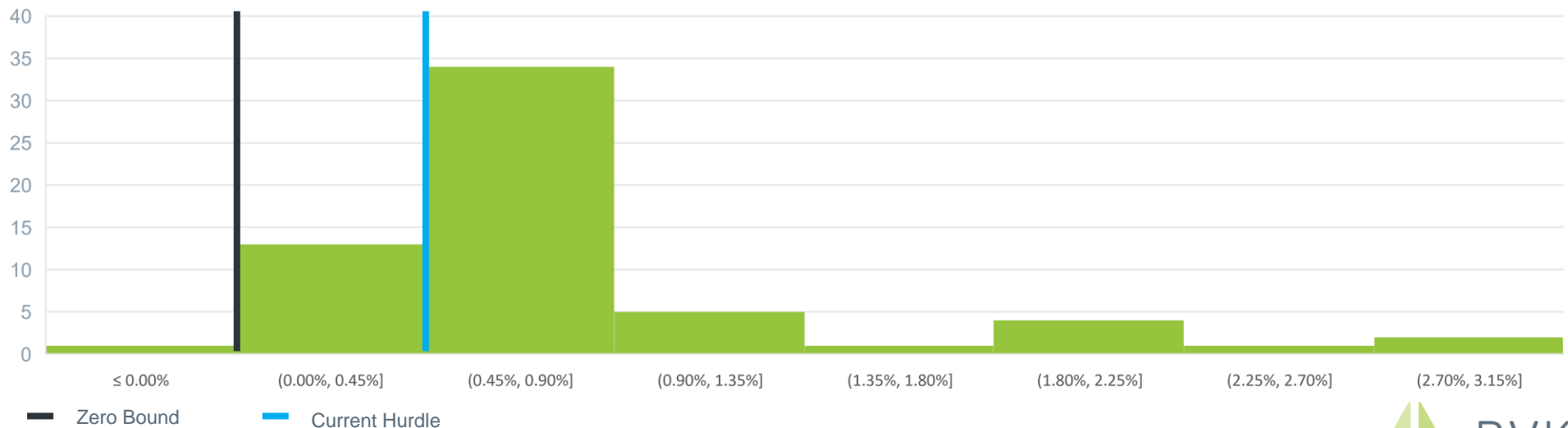


# Total Fund Excess Returns Distribution – Hurdle Rate 45 bps

Total Fund Excess Returns Distribution  
(Rolling 3 Years)

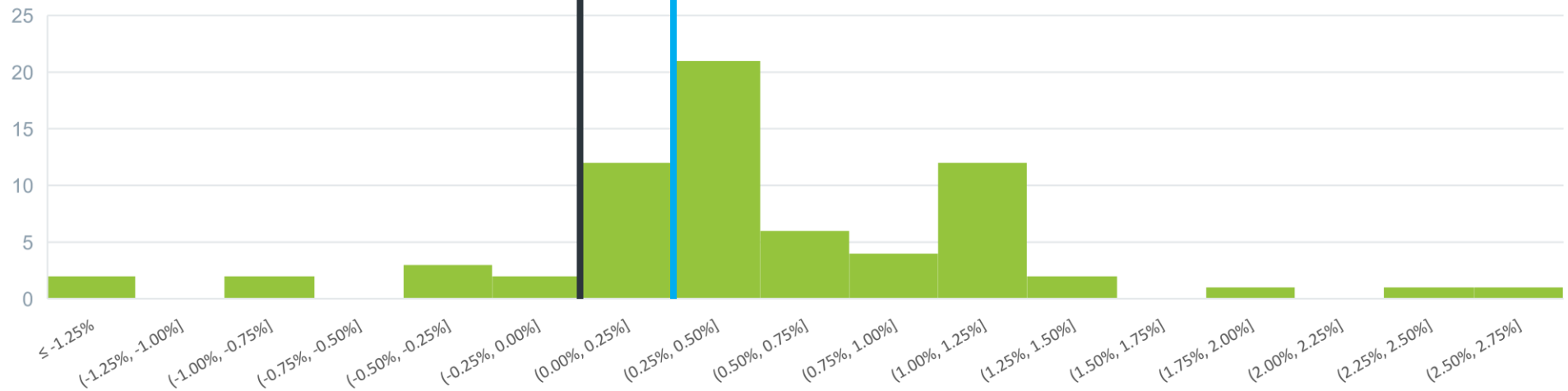


Total Fund Excess Returns Distribution  
(Rolling 5 Years)

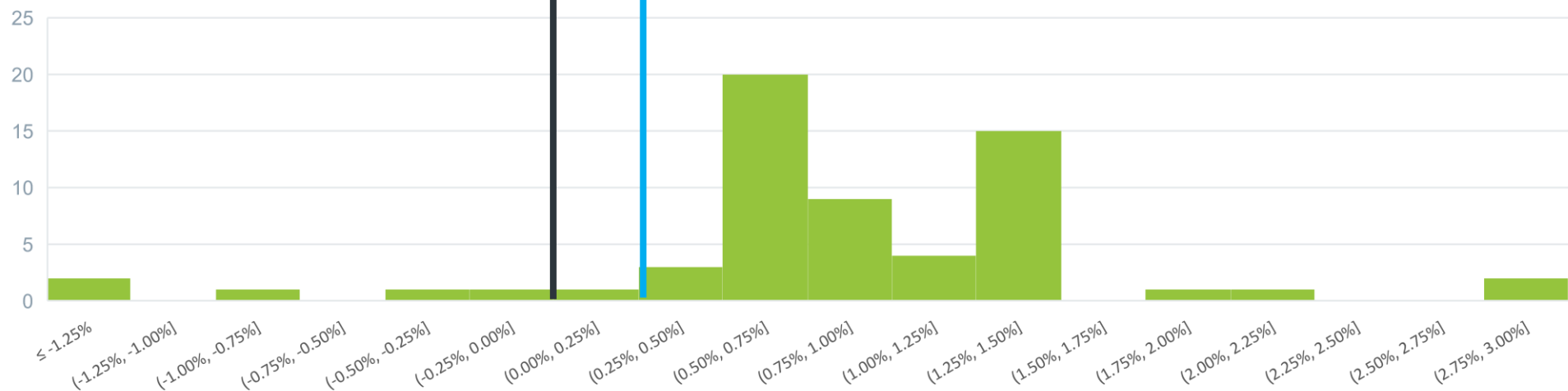


# Fixed Income Excess Returns Distribution – Hurdle Rate 25 bps

Fixed Income Excess Returns Distribution  
(Rolling 3 Years)



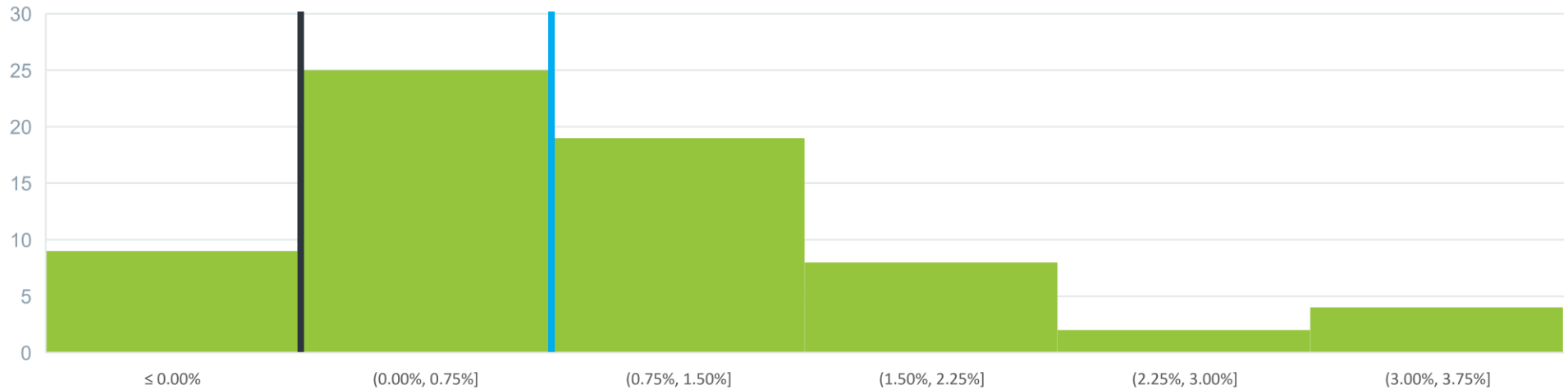
Total Fixed Income Excess Returns Distribution  
(Rolling 5 Years)



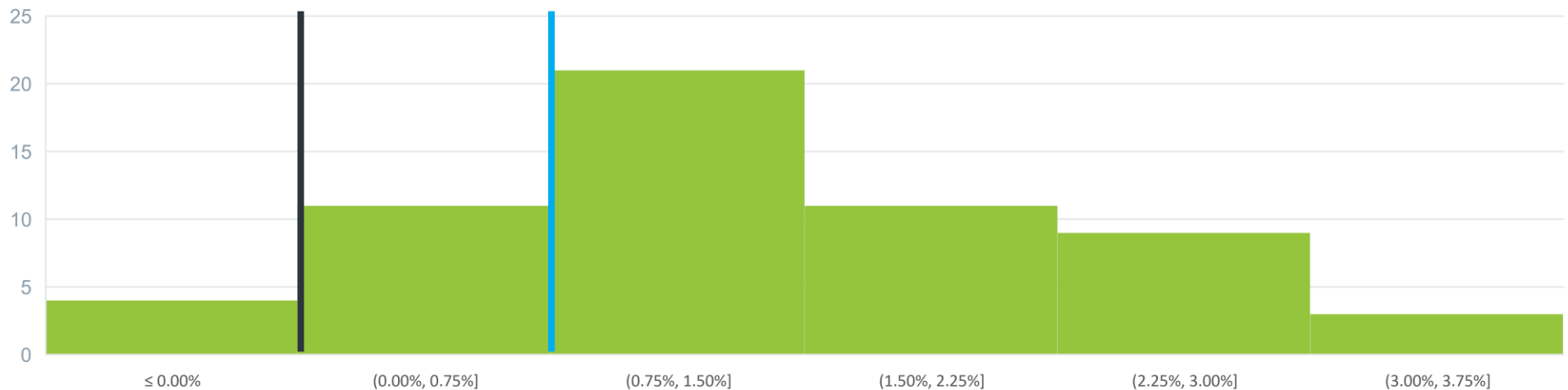
— Zero Bound      — Current Hurdle

# Credit Strategies Excess Returns Distribution – Hurdle Rate 75 bps

Credit Strategies Excess Returns Distribution  
(Rolling 3 Years)



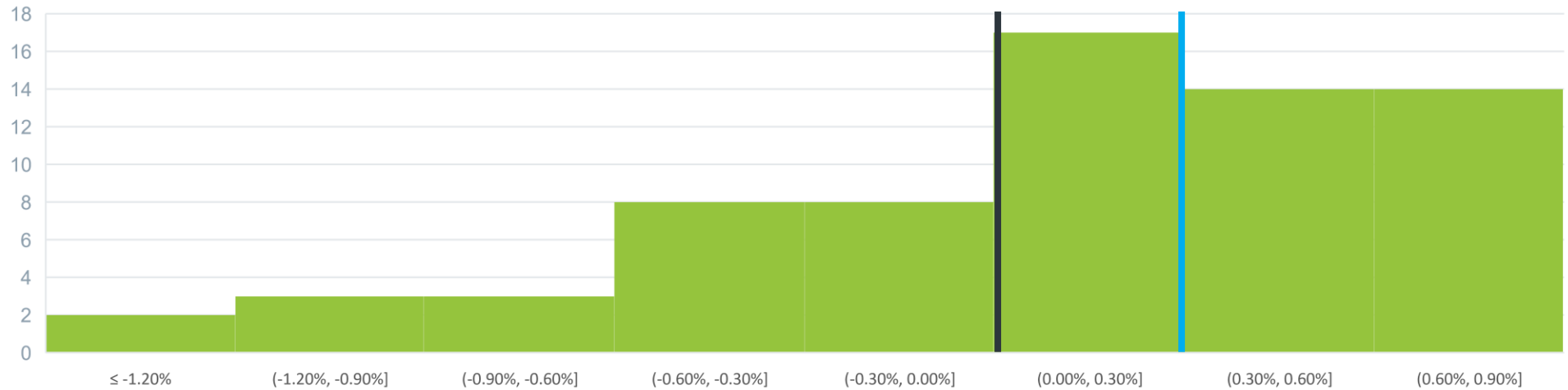
Credit Strategies Excess Returns Distribution  
(Rolling 5 Years)



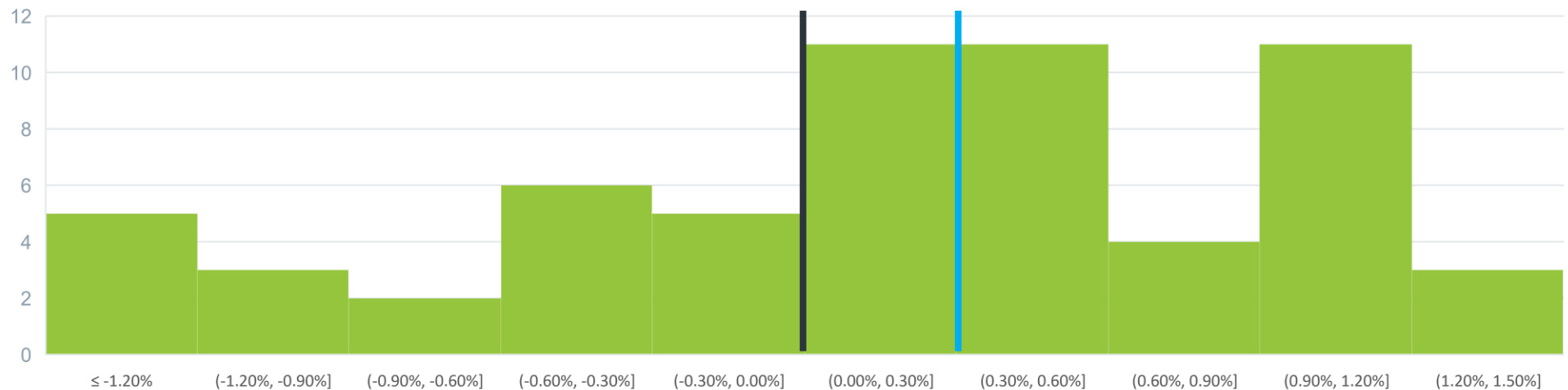
— Zero Bound      — Current Hurdle

# Public Equity Excess Returns Distribution – Hurdle Rate 30 bps

Public Equity Excess Returns Distribution  
(Rolling 3 Years)



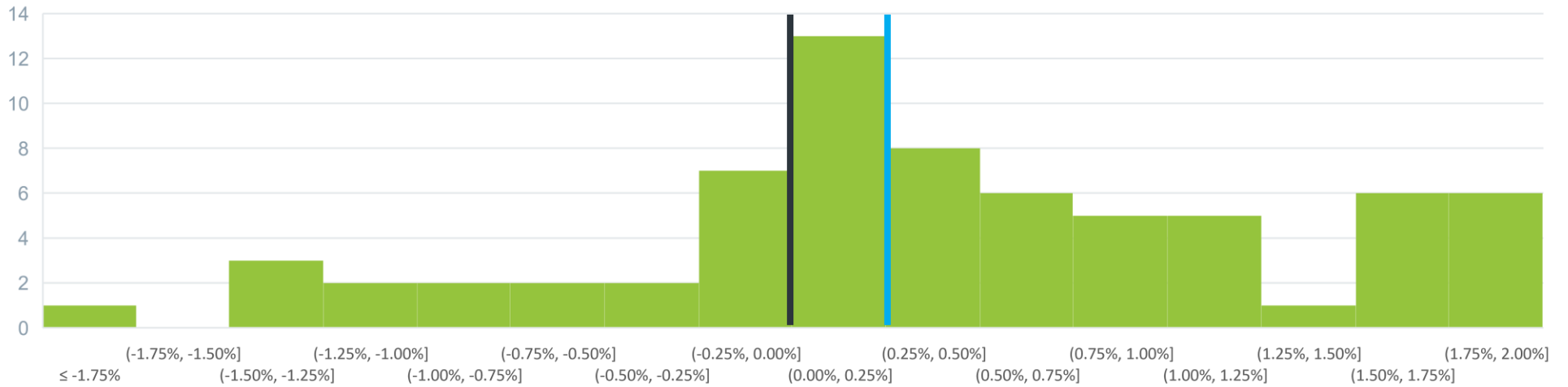
Public Equity Excess Returns Distribution  
(Rolling 5 Years)



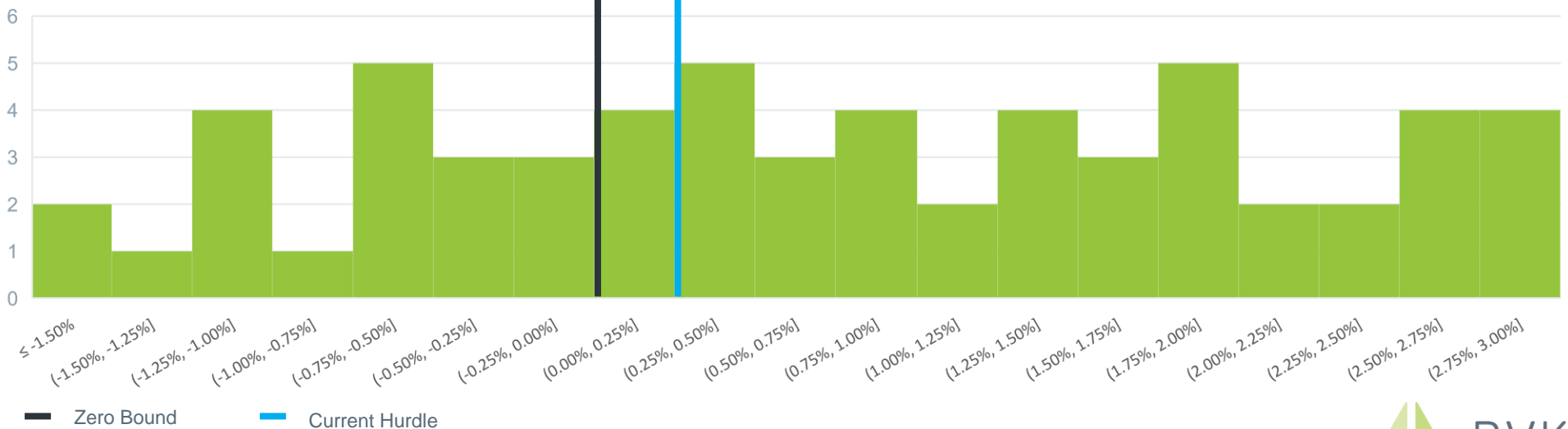
— Zero Bound      — Current Hurdle

# IEM Excess Returns Distribution – Hurdle Rate 25 bps

IEM Excess Returns Distribution  
(Rolling 3 Years)



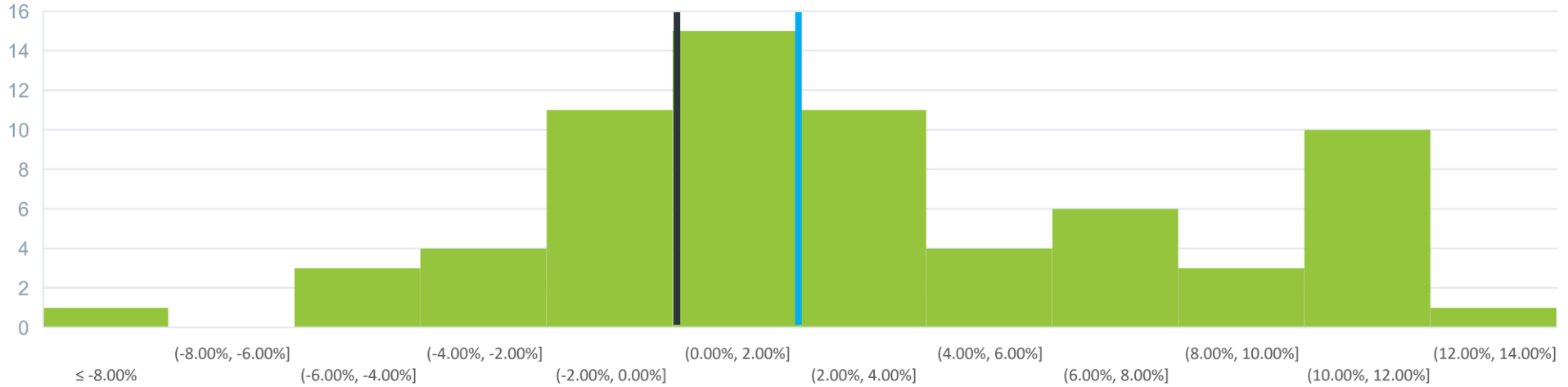
IEM Excess Returns Distribution  
(Rolling 5 Years)



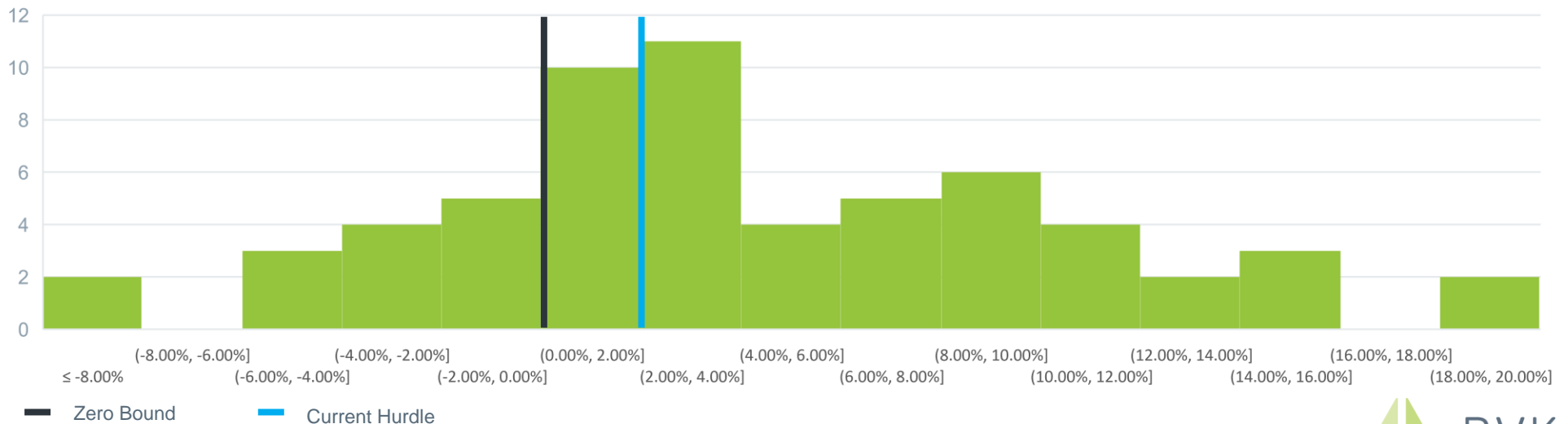
— Zero Bound      — Current Hurdle

# Private Equity Excess Returns Distribution – Hurdle Rate 200 bps

Private Equity Excess Returns Distribution  
(Rolling 3 Years)



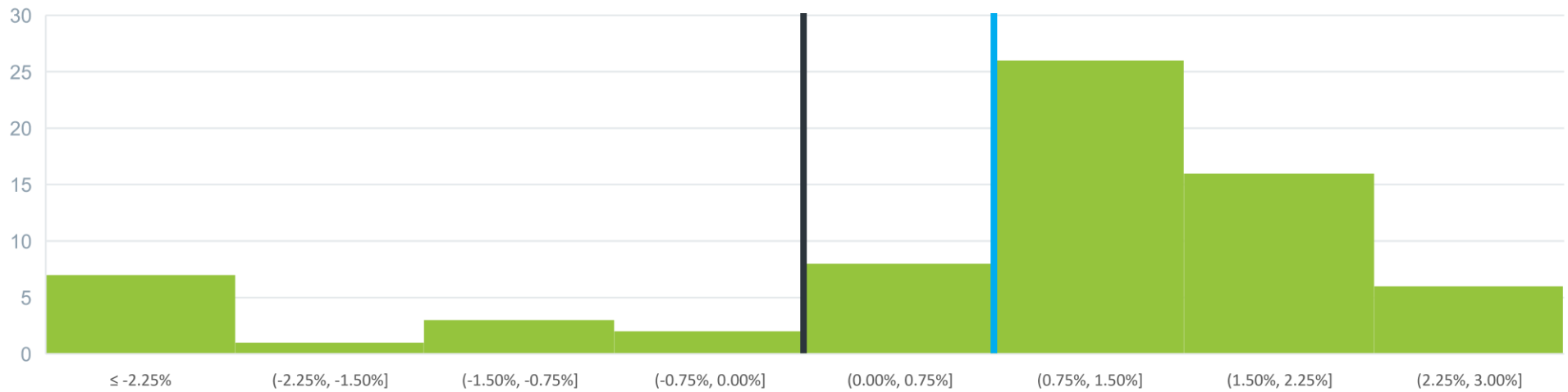
Private Equity Excess Returns Distribution  
(Rolling 5 Years)



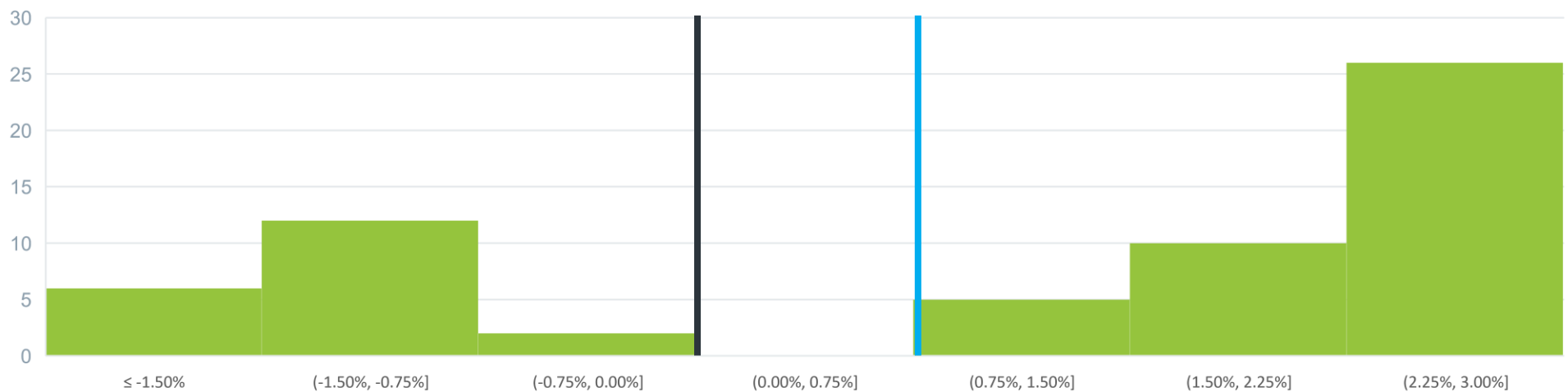
— Zero Bound      — Current Hurdle

# Real Assets Excess Returns Distribution – Hurdle Rate 75 bps

Real Assets Excess Returns Distribution  
(Rolling 3 Years)



Real Assets Excess Returns Distribution  
(Rolling 5 Years)



Zero Bound
  Current Hurdle

PORTLAND

BOISE

CHICAGO

NEW YORK

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